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WIDEBAND TRANSMISSION TEST SET

OPERATION / MAINTENANCE MANUAL

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Sierra®
A DIVISION OF LEAR SIEGLER, INC.

Sierra 812A Operation/Maintenance Manual

The Operation/Maintenance manual for the Sierra 812A contains information concerning the options for PAR (Peak-to-Average Ratio) and Return Loss. These options do not exist in all units. If the unit shipped with this manual has an A6 Board, it contains the Return Loss option; if it has an A7 Board, it contains the PAR option.

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SECTION 1

GENERAL

1.1 INTRODUCTION

1.1.1 This manual supplies the information required to operate and maintain the Sierra 812A Wideband Transmission Test Set. This section provides a general description of the set and an overview of its applications.

1.1.2 Subsequent sections describe in detail the operating controls and indicators, provide a functional description with block diagrams, discuss operating procedures, supply maintenance instructions, and present technical data. The final section is an appendix which includes default values, error numbers, and readouts for selected functions.

1.2 GENERAL DESCRIPTION

1.2.1 The 812A is a microprocessor-based test set which measures the following analog line parameters that affect data transmission:

- Circuit loss and frequency response
- Attenuation distortion
- Noise
- Noise-with tone
- Signal/noise
- Noise/ground
- Impulse noise
- Peak-to-average ratio
- Return loss measurements over two-wire/four-wire segments

1.2.2 Key elements of this compact unit are a microprocessor with a pressure-sensitive membrane keyboard, and an LCD alphanumeric display. The 812A has three sets of keypads—FUNCTION, DISPLAY, and ENTRY; it also has configuration pushbutton controls. Nine FUNCTION keys allow an operator to select the appropriate transmit and receive circuits for a particular test. Each measurement mode is coordinated with its respective key.

1.2.3 These nine basic functions can then be modified, as necessary, by using the ENTRY keys. The ENTRY keypad is also used to enter numeric data, such as Level and other selectable test variables.

1.2.4 Test variables are normally selected before the test begins, and are entered in a specific sequence. FUNCTION, DISPLAY, and ENTRY keys have associated LED indicators, which illuminate when the corresponding key is depressed. The flashing of an LED associated with one of these keys, or of a number in the display, prompts the operator to make the next selection. Once the ENTER key has been pressed, the LED stops flashing.

1.2.5 The 812A possesses these operations capabilities:

- An extended frequency range (50 Hz to 85 kHz) is provided.
- Attenuation distortion may be measured using any frequency as the reference.
- Five types of noise measurements can be made: C-message noise, 3 kHz flat noise, 15 kHz flat noise, 50 Kb/s flat noise, or program weighting format noise.
- The impulse count can be measured at three distinct levels for a selectable period of time, and at either a standard (8 PPS) or a channel-limited (100 PPS) rate.

Options:

- The P/AR function allows an operator to make the standard P/AR measurement required for line turn-up and maintenance in the Bell System.
- Return Loss (two-wire and four-wire) is measured for Echo Return, Singing Return, and Singing Return High cases.

1.2.6 The 812A is designed for use on telephone lines. It can be an invaluable aid to data installation groups and VF test personnel.

SECTION 2

PHYSICAL DESCRIPTION

2.1 GENERAL

2.1.1 This section provides a physical description of the test set, identifies the controls on the front panel, and describes their functions.

2.1.2 The 812A Wideband Transmission Test Set is a portable instrument in an aluminum housing. It weighs 22 pounds, including batteries. When the set is used in a horizontal position, the carrying handle can be used as a stand.

2.1.3 The LCD displays, the operating controls (including keypads and pushbuttons), the POWER switch, and the DIAL/RCV/TRMT jacks are all conveniently located on the front panel of the test set. The Voltage Selection switch, an AC line fuse, and the input connector are all located on the rear of the instrument.

2.2 ACCESSORIES

2.2.1 The test set is equipped with a standard power connector/fuse/switch assembly and a removable power cord. Options available are the SOF-PAK carrying case (with a large accessories compartment) and a shipping trunk.

2.3 CONTROLS AND INDICATORS

2.3.1 Operating controls described in this section are listed in the following index:

ITEM	DESCRIPTION	PAGE
1	FUNCTION Keys	2-2
2	DISPLAY Keys	2-6
3	ENTRY Keys	2-7
4	Configuration Pushbuttons	2-9
5	Digital Display	2-11
6	Rear Panel	2-12
7	Internal	2-12

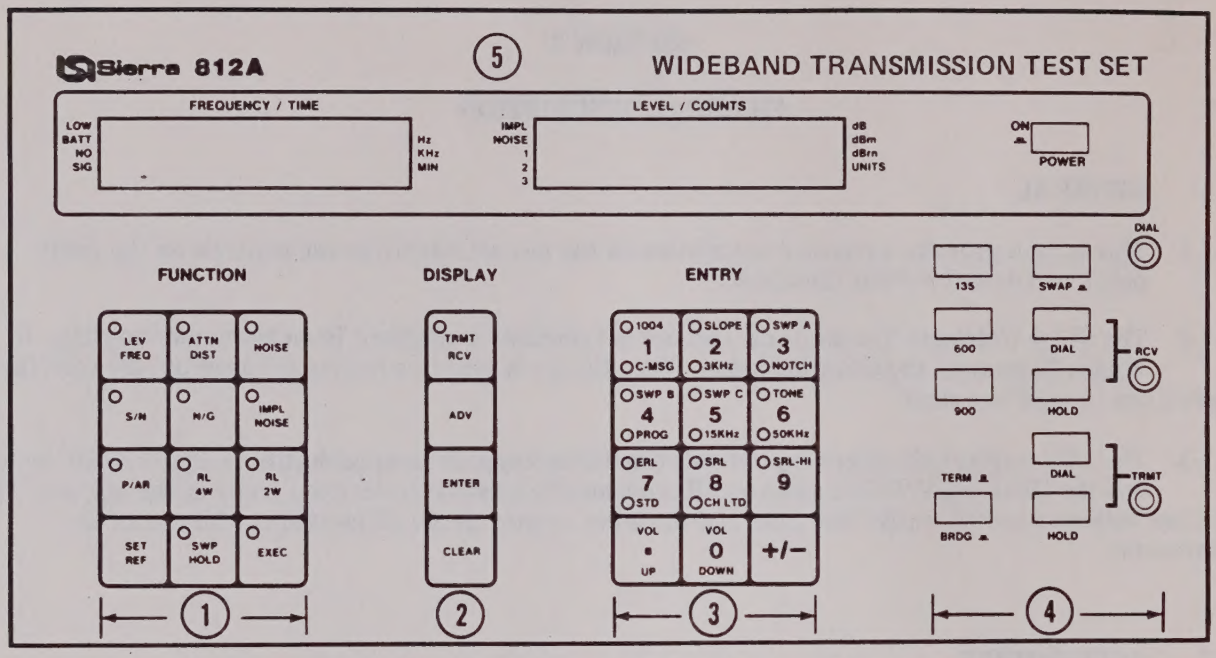
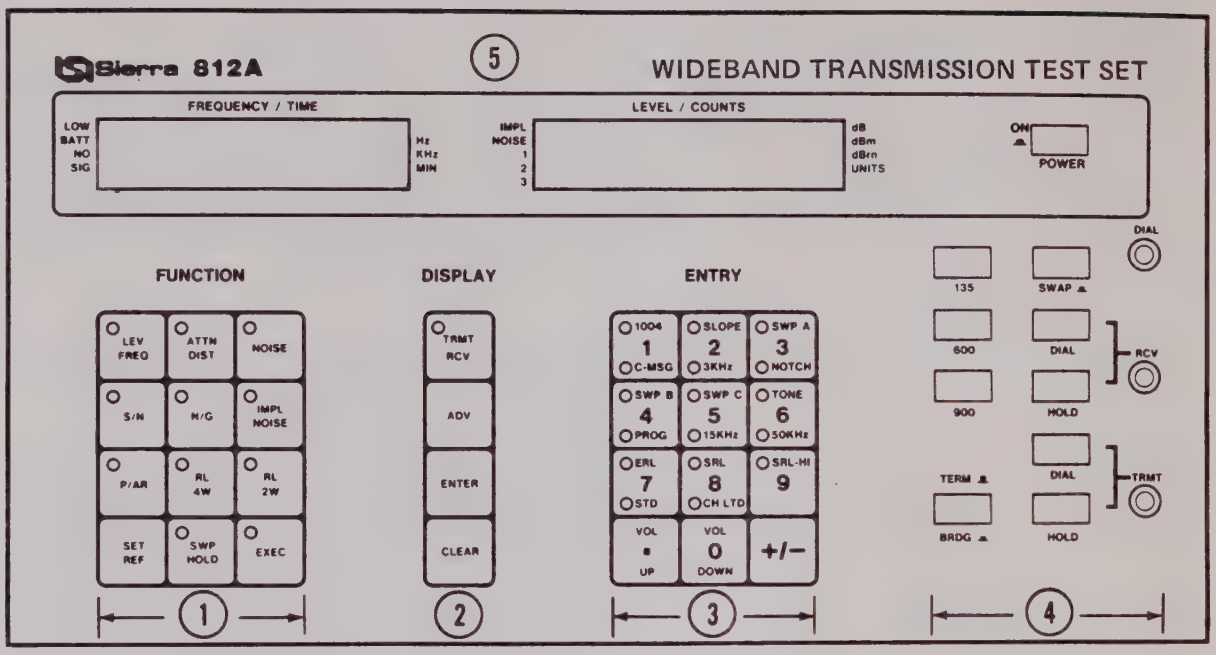


Figure 2-1. Front Panel Showing Numbered Items

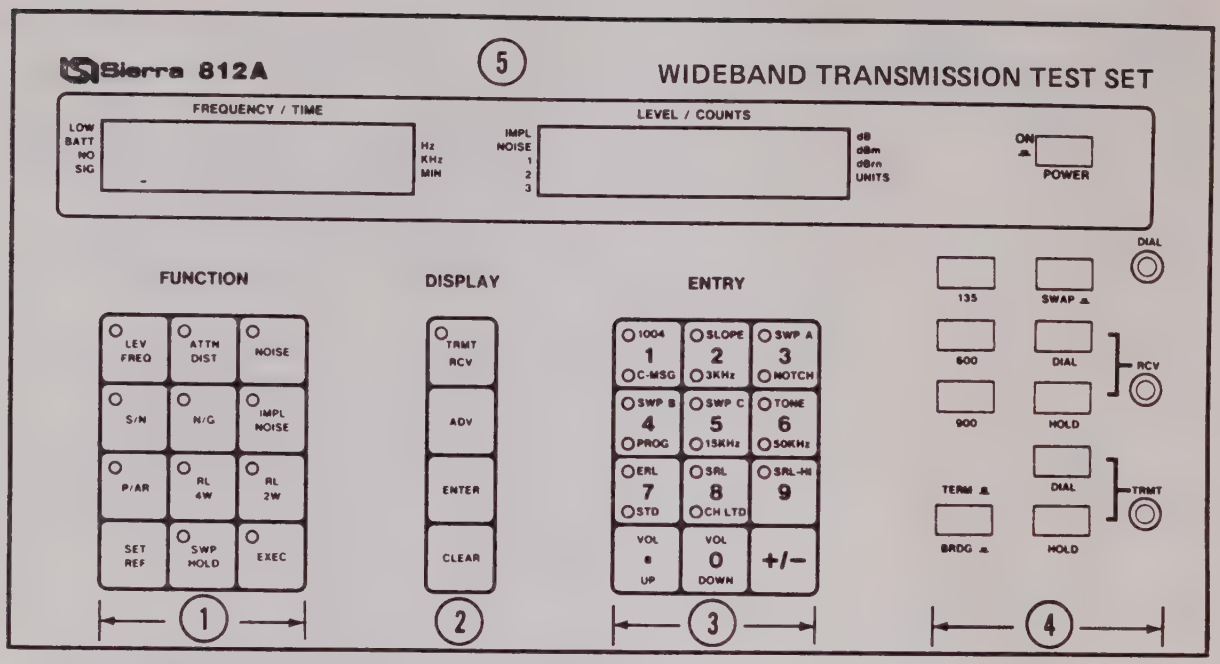
ITEM	NAME	DESCRIPTION
1	FUNCTION Keys	Select the test function of the instrument. Nine keys in the first three rows are directly related to the different types of tests. Each of the three colored keys performs a specific function during a test. When a function key is selected, the LED associated with it lights steadily. This indicates to the user that the test associated with the lit LED is current, and that further keypad entries will pertain to that test until another function key is pressed. Once a function key is pressed, the user is prompted for entry of parameters applicable to the test function via Digital Display (see Item 5) and flashing LED on Entry keypad (see Item 3). By operating any one of the remaining eight function keys while a selected test function is current or in progress, the test is immediately aborted.
	LEV/FREQ	Selects a tone source for transmit and the full-wave average levelmeter for receive. **Transmit Frequency**: The test set provides a choice of six functions—1004 Hz test tone, SLOPE tones, Sweep A, Sweep B, Sweep C, or a discrete tone frequency. The sweep frequency plans allow a preprogrammed series of tones to be transmitted at 5 second intervals, unless manually overridden with the SWP HOLD key. Frequency Range: 50 Hz to 85 kHz.

ITEM	NAME	DESCRIPTION
1	LEV/FREQ (Continued)	**Transmit Level:** The output level can be adjusted in 0.1 dB steps within a range of -50 dBm to +10 dBm. Select and enter the level using numeric ENTRY keys and the ENTER key, respectively.
	ATTN DIST	Measures the relative level, with loss displayed as the difference in dB from the loss at a reference frequency (typically 1004 Hz). The display reads Attenuation Distortion or a relative loss in dB (direct reading). The test set provides a choice of four functions – SLOPE tones, Sweep A, Sweep B, or Sweep C. The output level can be selected and entered using numeric ENTRY keys and the ENTER key, respectively. The sweep frequency plan allows a preprogrammed series of tones to be transmitted at 5 second intervals, unless manually overridden. The test starts with 1004 Hz to set the reference, but a frequency other than 1004 Hz can be selected as a reference using the SET REF key.
	NOISE	Measures circuit noise and noise-with-tone in a listening mode. Selects a filter and an RMS meter for receive and quiet termination for transmit. The test set provides a choice of five noise filters–C-MSG, 3 kHz, PROG, 15 kHz, or 50 kb/s. The noise measurement can be done with or without a NOTCH filter. The display reads the noise level in dBrn (direct reading).
	S/N	The S/N Function automatically selects a NOTCH filter, in combination with the selected filter for receive and the 1004 Hz tone for transmit. This measurement selects the levelmeter prior to passing through the NOTCH filter, and also connects the noise meter after passing through the NOTCH filter. The difference between the two values is automatically calculated and the result is displayed as a direct value of S/N ratio in dB. The display can be stepped, using the ADVANCE key, to read first a notched noise in dBrn, then the frequency (1004 Hz) and level of the tone. Measures noise-with-tone in a non-listening mode.
	N/G	Selects a quiet termination for the transmitter, and measures common mode noise-to-ground weighted by the selected filter. The result is displayed in dBrn.



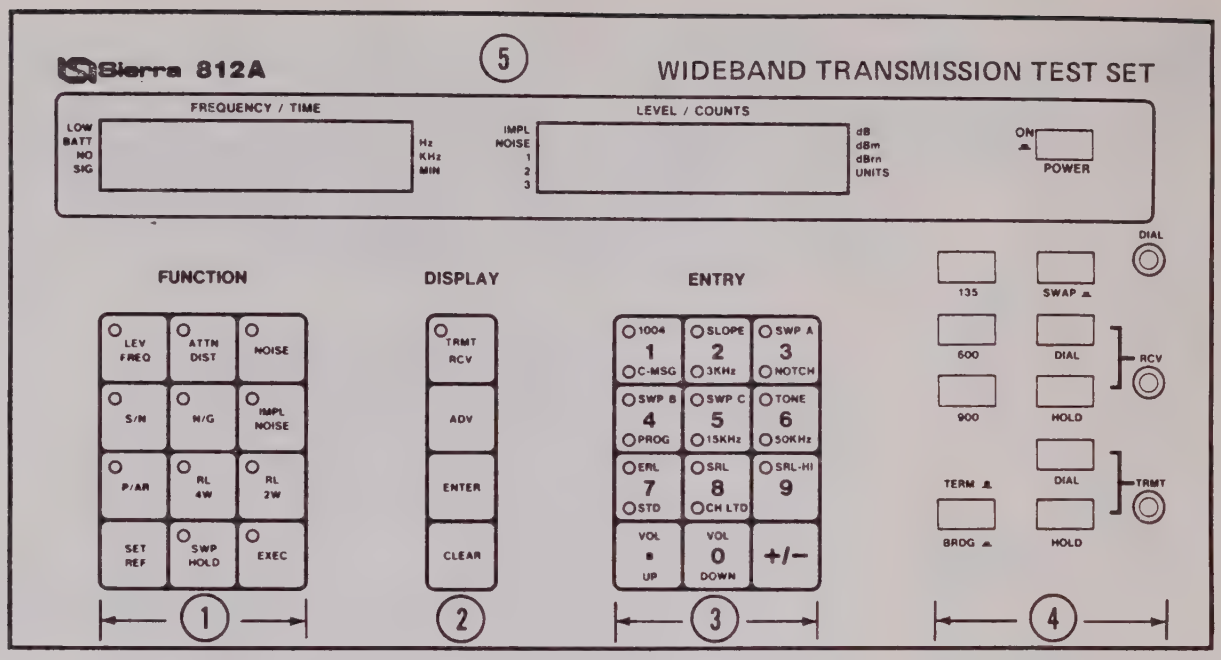
ITEM	NAME	DESCRIPTION
1	IMPL NOISE	Selects a 1004 Hz test tone for the transmitter, and the notch filter in the receiver, then counts noise impulses for a selected time interval. Impulse Noise counts are taken at three levels: The Lowest (Level No. 1) is at threshold; Mid (Level No. 2) is preset at +4 dB above the threshold; and High (Level No. 3) is preset at +8 dB above the threshold. This function includes selection of Transmit Level, Noise Filter, Threshold Level, Count Rate, and Count Time. Transmit Level: −50 dBm to +10 dBm range Noise Filter: C-MSG, 3 kHz, PROG, 15 kHz, 50 kb/s Threshold Level: −30 dBrn to 110 dBrn range Count Rate: Standard (8 pps) or Channel-limited (100 pps) Count Time: 1 through 9999 minutes, or continuous count (count time set to 0 minutes).
	P/AR	The Peak-to-Average Ratio measurement selects a special transmit signal composed of 16 non-harmonically related sine waves and a P/AR receive filter. This is a figure-of-merit test, which is primarily influenced by attenuation distortion, envelope delay distortion, and noise. It is most useful as an indication of channel degradation based upon comparisons with previous P/AR measurements over a period of time.

ITEM	NAME	DESCRIPTION
1	RL 4W	The 4-Wire Return Loss function transmits a shaped noise test signal and measures a **received signal level.** The test signal is obtained by passing a wideband noise source through a bandpass filter. A choice of three transmit filters is available: Echo Return Loss (ERL), Singing Return Loss (SRL), and Singing Return Loss High (SRL-HI). The measurement is made by transmitting band-limited noise of known power, and measuring the energy reflected back to the **receiver.** On a 4-wire circuit Return Loss is the power ratio—transmitted power to reflected power—corrected for any difference in the expected transmission levels (TLPs) of the sending and receiving sides. This measurement requires a quiet termination at the distant end of the circuit.
	RL 2W	The 2-Wire Return Loss function transmits a shaped noise test signal and measures the **reflected signal level.** An internal hybrid in the test set is used for this measurement. The test signal is obtained by passing a wideband noise source through a bandpass filter. A choice of three transmit filters is available. They are Echo Return Loss (ERL), Singing Return Loss (SRL), and Singing Return Loss High (SRL-HI). The measurement is made by transmitting band-limited noise of known power and measuring the energy reflected back to the **transmitter.** The Return Loss is the ratio of the transmitted power to the reflected power. Return Loss measurements require a quiet termination at the distant end of the circuit.
	SET REF	The Set Reference function is used as follows: (1) During the **Attenuation Distortion** test to select a frequency other than 1004 Hz, at which the reference level is established. If the SET REF Key is not used, 1004 Hz will be the default reference frequency. (2) During the 4-Wire Return Loss measurement, the transmission loss (transhybrid loss plus circuit loss) in the loop is determined by putting a short at the 2-wire side of the hybrid. Pressing the SET REF key sets that determined value as a reference to be used with future Return Loss readings. Return the hybrid to normal operating mode to read the Return Loss in dB.



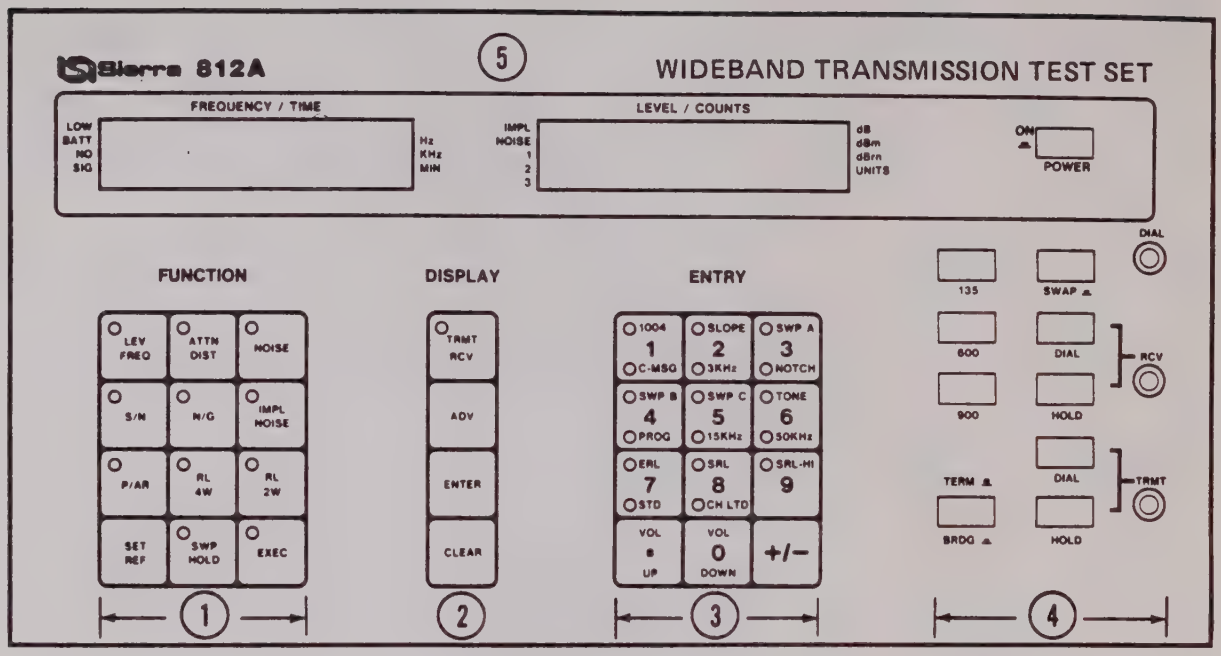
ITEM	NAME	DESCRIPTION
1	SET REF (Continued)	(3) During an Impulse Noise measurement, pressing the SET REF key starts the test. The counting begins and the display reads the level #1 threshold count.
	SWP HOLD	This is a dual function key. The SWP HOLD key can be used to start or stop the sweep at any frequency in the sweep plan. When first pressed after a pause in a sweep, it starts the sweep. Next use will stop the sweep. Pressing the key again restarts the sweep.
	EXEC	Completes the selection process for a test, and executes the test function according to the selected parameters.
2	DISPLAY Keys	The operation of any one key in this group determines the information in the display windows. The CLEAR and ENTER keys are operational only in FUNCTION ENTRY Mode.

ITEM	NAME	DESCRIPTION
2	TRMT/RCV	This is a dual function key. It switches the display between transmit and receive information. The associated LED shows whether TRMT is selected. Press the TRMT/RCV key to change the displayed information.
	ADV	The ADVANCE key is used as follows: 1. In S/N test, three displays can be selected: Signal-to-Noise ratio in dB; Noise in dBrn; Tone frequency plus the received level. 2. In Impulse Noise test, it selects which of the three threshold counters is displayed.
	ENTER	Completes the selection process at an entry level. Pressing the key tells the instrument to remember the currently selected value, and to use this value when executing the test. Invalid entry, such as an out-of-range numeric entry, generates an error message. The instrument reverts to the previously selected parameter.
	CLEAR	Cancels a selection or a partial entry. It is used to correct an entry before that value is being entered, erasing one digit at a time. It is also used to remove the notch filter in the noise measurement. *Note: It can not be used to change a selection after the ENTER key is operated.*
3	**ENTRY Keys**	This is a standard keypad used to enter numeric values. ENTRY keys choose conditions for all tests. Each key has triple functions and the functions are as noted on the key. The primary function is to enter numbers 1 through 9, zero and ±. The secondary functions vary with the keys. LEDs are associated with each secondary function. Flashing LED shows the prompted selection request. Once the ENTER key is operated, the LED stops flashing to indicate an active test selection. When pressed during a frequency sweep, the +/– key causes the output frequency to sweep backwards one step for each push. SECONDARY FUNCTIONS **Six Transmit Frequency Plans Used for LEV/FREQ and ATTN DIST Measurement**
	1004	A 1004 Hz tone is transmitted.



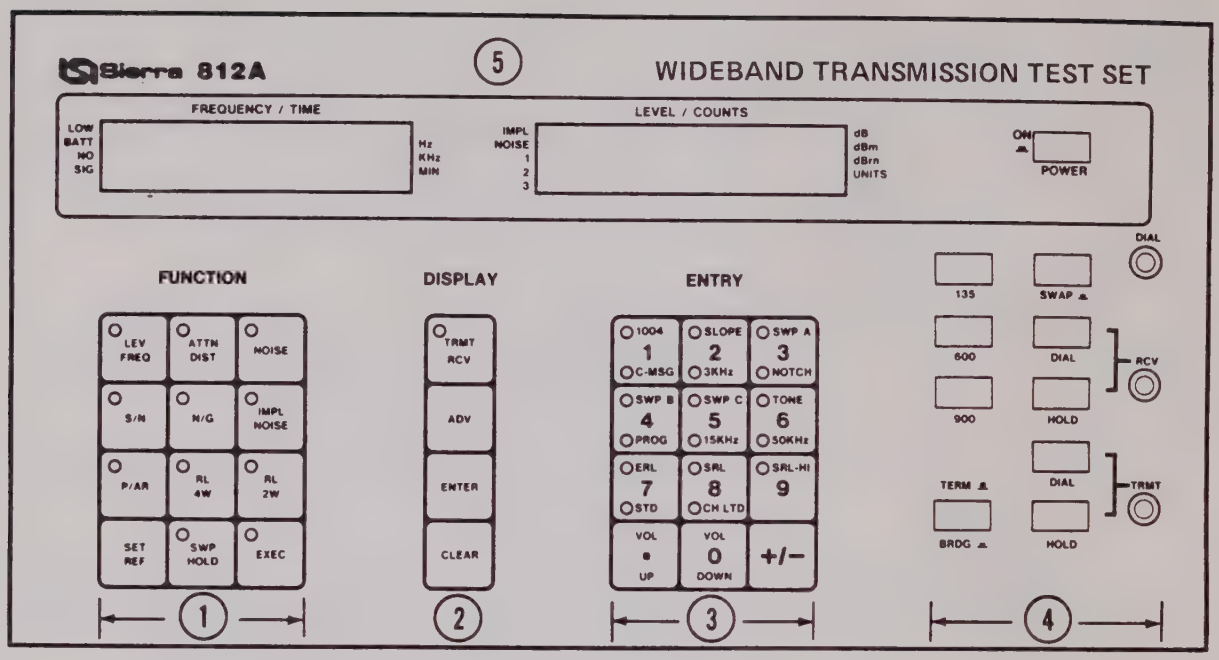
ITEM	NAME	DESCRIPTION
3	SLOPE	Provides Slope tones – 404 Hz, 1004 Hz, and 2804 Hz. This frequency plan is preceded by 1004 Hz tone.
	SWP A	Provides a Standard Sweep covering the frequency range between 304 Hz and 3204 Hz. The frequency is stepped 17 times at five second intervals. The frequencies in the sweep are 304 Hz, 504 Hz, 604 Hz, 804 Hz, 1004 Hz, 1204 Hz, 1404 Hz, 1604 Hz, 1804 Hz, 2004 Hz, 2204 Hz, 2404 Hz, 2504 Hz, 2704 Hz, 2804 Hz, 3004 Hz, and 3204 Hz. This frequency plan is preceded by a 1004 Hz tone.
	SWP B	Provides a sweep covering the range between 204 Hz and 4004 Hz in 100 Hz steps (excluding 2604 Hz) at five second intervals. This frequency plan is preceded by a 1004 Hz tone.
	SWP C	Provides a programmable sweep. START frequency, STOP frequency, STEP size, and SKIP frequency are sequentially entered using numeric entries.
	TONE	Provides a tone at a selected frequency. The tone is selected using numeric entries.
		Six Noise Weighting Filters Used for NOISE, S/N, N/G, and IMPULSE NOISE Measurement
	C-MSG	C-Message Filter approximates frequency weighting of a telephone handset. The response is approximately flat across the center of the band (600-3000 Hz).

ITEM	NAME	DESCRIPTION
3	3 kHz	A 3 kHz bandpass flat filter. It includes more low frequency and high frequency signals than does C-MSG.
	NOTCH	A notch filter centered at 1010 Hz. It eliminates holding tone in the range from 995 Hz to 1025 Hz, and is used for Noise-with-Tone measurements.
	PROG	A program weighting filter for noise measurements on a program channel.
	15 kHz	A 15 kHz flat filter for wider bandwidth noise measurements on program circuits (not used on voice message circuits).
	50 kHz	A 50 kHz flat filter for noise measurement on a DDS circuit.
		Transmit Filters Used for Return Loss Measurements
	ERL	Echo Return Loss filter. Weighting: 560 Hz to 1965 Hz (3 dB points).
	SRL	Singing Return Loss filter. Weighting: 260 Hz to 500 Hz (3 dB points).
	SRL-HI	Singing Return Loss-High filter. Weighting: 2200 Hz to 3400 Hz (3 dB points).
		Count Rate Used for Impulse Noise Measurements
	STD	Selects a standard count rate (8 pps, having a blanking interval of 125 ms after each count).
	CH LTD	Selects a channel-limited count rate (100 pps, having a blanking interval of 10 ms after each count).
		Speaker Volume Adjustment Keys
	VOL UP/ VOL DOWN	These keys are active in Measure mode. Pressing either key adjusts the volume of the speaker up or down in steps.
4	**Configuration Pushbuttons**	These pushbuttons control how the instrument is connected to the circuit. All pushbuttons operate as ON/OFF switches. Button released (normal position) is an 'OFF' state. Button pushed in is an 'ON' state.
		Selection of Impedance Values of TRMT and RCV
	135 600 900	Selects 135 ohms as an input and output impedance Selects 600 ohms as an input and output impedance Selects 900 ohms as an input and output impedance



ITEM	NAME	DESCRIPTION
4	TERM/BRDG	Selects terminated or bridging condition for Receiver. When the button is released the receiver is terminated. When the button is pushed in the receiver is bridged (> 50 k ohms).
	SWAP	Switches the Transmit and Receive ports and their associated hold circuitry.
	RCV DIAL and TRMT DIAL	A separate dial facility for Receive and Transmit ports permits a test line to be dialed up by means of an external telephone handset connected to the Dial jack. When the button is released the Dial terminals are disconnected. When the button is pushed in the Dial terminals are connected to appropriate jack (RCV or TRMT).
	RCV HOLD and TRMT HOLD	Two separate active holding circuits for Receive and Transmit draw holding current via a selected port. When the button is released the holding circuit is disconnected. When the button is pushed in, the holding circuit is connected to the circuit on the port.

ITEM	NAME	DESCRIPTION
4	DIAL Terminal	Standard 310-type jack used for connecting dial set.
	RCV Terminal and TRMT Terminal	Standard 310-type jacks used for connection to lines.
	Power Switch	Red pushbutton
	ON ▬	When button is released, the instrument is in standby and the batteries (optional) are charging, if connected to an AC supply. When button in pushed in, power is supplied to the measurement circuitry and the batteries are not charging.
5	**DIGITAL DISPLAY**	Consists of seven-segment LCD displays. Frequency/Time is displayed in the left window and Level/Counts/Units displayed in the right window. The display is switchable from TRMT to RCV using the TRMT/RCV key. In addition to the numeric values, the display has twelve bar displays. These displays provide status information on the instrument, and show the units of displayed information.
	LOW BATT	Lights when internal batteries are at a low level.
	NO SIG	Flashes during timed Impulse Noise test when the 1004 Hz tone is lost, i.e., no signal is received. This will be displayed when the 1004 Hz tone drops by at least 12 dB from the original level for one second, or when the frequency is outside the range from 995 Hz to 1025 Hz. This condition will stop an Impulse Noise test since the results are invalid. Also flashes during P/AR test when no input signal is present.
	Hz/kHz	Lights to indicate whether the received frequency is in Hertz or kiloHertz.
	MIN	Lights during Impulse Noise test. It shows time selected for test, time left, or time elapsed depending on test selected.
	IMP NOISE	IMP NOISE flashes while Impulse Noise test is running.
	1, 2, 3	Impulse Noise Level 1, 2, and 3 lights to show which Impulse Noise counter is currently being displayed (No. 1 is LOW, No. 2 is MID, No. 3 is HIGH).



ITEM	NAME	DESCRIPTION
5	dB	Lights when the display reads the relative strength (power) of a signal parameter. Unit: decibel.
	dBm	Lights when the display reads an absolute power referenced to 1 milliwatt.
	dBrn	Lights when the display reads decibels above reference noise. Reference noise is equivalent to -90 dBm signal.
	UNITS	Lights when the display reads P/AR units or counts in Impulse Noise.
6	**Rear Panel**	
	AC Power	Fused 115/230 VAC Connector. Voltage selection (115/230V) available on the plug-in card. Slow Blow Fuse: 3/8A for 115V and 3/16A for 230V.
7	**Internal**	
	Speaker	Provides a facility for audio monitoring of the Receiver with a step volume control.
	Backup Battery	Provides a backup to remember the test parameters when the unit is turned 'OFF'. It provides backup for a minimum of 2 weeks.

SECTION 3

FUNCTIONAL DESCRIPTION

3.1 GENERAL

3.1.1 The Sierra 812A Wideband Transmission Test Set is a full-duplex transmission measurement system controlled by a microprocessor; Figure 3-1 provides a functional block diagram of this system. Microprocessor interfaces to the various sections of the 812A are described in Figure 3-2, while Figure 3-3 depicts the 812A's AC and DC (optional battery pack) power supply circuits.

3.2 LINE INTERFACE

3.2.1 The TRMT and RCV lines each have a DIAL and HOLD interface. Further, the TRMT, RCV, and DIAL lines all use 310-type jacks. High voltage protection is also provided to prevent damage to the test set caused by lightning-induced voltage surges.

3.2.2 All standard impedances (900, 600, and 135 ohms) are provided, and the set may be placed in either a bridged or a terminated mode through the appropriate use of the TERM/BRDG switch. When operating in the terminated mode, either a 135, 600, or 900 ohm termination may be selected as appropriate for the line under test. The bridging mode permits measurements to be performed on a working circuit, or on circuits which are already terminated; high impedance (greater than 50 k ohms) is presented to the circuit under test, resulting in a bridging loss of 0.25 dB or less.

The DIAL port allows an external telephone handset to be connected. In the DIAL mode, either the transmit or receive direction of the line under test can be dialed-up. The HOLD switch draws a holding current for the associated TRMT or RCV port. The SWAP switch allows the transmit and receive lines to be interchanged between ports.

3.3 SELF TEST

3.3.1 Each time the 812A is turned on, a complete self test is performed automatically. During this test, the transmitter test tone is routed internally to the receiver input to provide a check of the Receiver Front End and Amplifier Stages, Detectors, and the Frequency Counter, as well as of the Attenuator and Output Driver for the Transmitter section. Any option boards present are also tested. The self test also allows the user to check the 812A display.

3.4 TRANSMITTER

3.4.1 As shown in Figure 3-1, the transmit section consists of a signal source and a level control. The standard signal source is a sinewave synthesizer. A P/AR waveform generator, and a wideband noise generator for return loss measurements, are both available as options. If either or both of these options are chosen, the appropriate source is selected by depressing the FUNCTION key. The desired signal is then routed through the analog multiplexer and the level control to the line terminating circuitry.

3.4.2 The sinewave synthesizer generates single frequencies in 1 Hz steps over the 50 Hz to 85 kHz range. Signal level is also variable over a range of -50 dBm to +10 dBm in 0.1 dB steps (the optional P/AR and Return Loss functions have a 0 dBm maximum output). Both signal frequency and level can be selected by using the numeric ENTRY keys.

3.4.3 The sinewave synthesizer also provides the SLOPE test tones, two VF sweep plans (SWP A and SWP B), and a programmable sweep (SWP C). In the SWP A and SWP B modes, the synthesizer is programmed to blank the 2600 Hz SF tone. This prevents the loss of the VF channel connection on dial-up trunks using SF signaling units.

3.4.4 The transmitter is controlled by the EXECUTE and SWP HOLD keys. When the 812A enters the FUNCTION ENTRY mode, the transmitter is automatically turned off. The transmitter can only be turned on again by entering the TEST mode using the EXECUTE key.

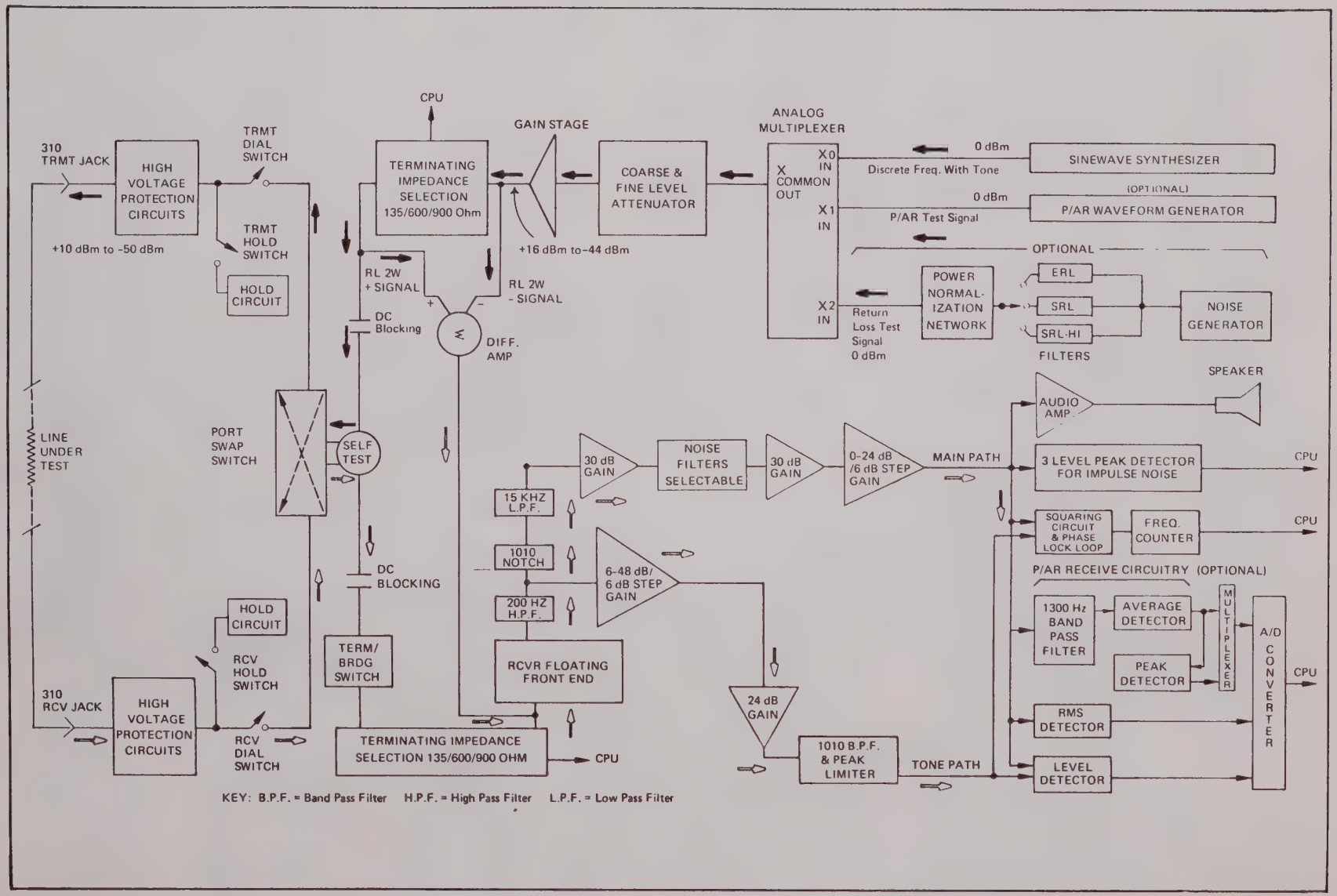


Figure 3-1. Functional Block Diagram Showing Signal Path

3.4.5 OPTIONAL TRANSMIT SIGNALS

(1) **P/AR Waveform Generator:** A special transmit signal composed of sixteen non-harmonically related sine waves is produced by the P/AR waveform generator. This waveform is passed through a special low pass filter prior to reaching the analog multiplexer.

(2) **Return Loss Test Signal:** The output of a wideband noise generator is passed through one of three types of transmit filters. Depending upon the type of return loss measurement selected, either an Echo Return Loss (560 Hz to 1965 Hz), Singing Return Loss (260 Hz to 500 Hz), or Singing Return Loss-High (2200 Hz to 3400 Hz) transmit filter is selected. The power normalization network normalizes the Return Loss test signal to 0 dBm.

3.5 RECEIVER

3.5.1 The signal received from the line under test is fed into the receiver front end; the receiver front end is isolated from power supply ground, and floats on the common mode voltage at the receive side of the line under test (see Figure 3-1).

After leaving the receiver front end, the received signal is routed along one of two possible paths (main or tone), and is filtered and/or amplified as appropriate for the test in progress. Filters available are a 200 Hz high pass filter, a 1010 Hz notch filter (noise measurements can be made with or without the notch), a 15 kHz low pass filter, and the noise filters. Similarly, a 1010 Hz bandpass filter in the tone path filters and limits the received signal for holding tone measurements. The function selected determines which filter(s) is used.

3.5.2 Once the signal has been amplified and/or filtered, it is routed to the detector stage. As shown in Figure 3-1, the basic elements of this stage are:

(1) **Audio Output Section:** This consists of an audio amplifier and speaker for monitoring the received signal. Speaker volume is adjustable up or down in steps by using the appropriate ENTRY keys.

(2) **3-Level Peak Detector:** Impulse Noise measurements are made at three levels, the first level being a selected threshold. Levels 2 and 3 are predefined at 4 dB and 8 dB, respectively, above the threshold. Each level has a separate counter.

(3) **Squaring Circuit and Phase Lock Loop:** The squaring circuit converts a sine wave to a square wave; the output from the phase lock loop is applied to the frequency counter, which reads the frequency of the received analog signal and conveys this data digitally to the CPU.

(4) **Full-Wave Average and RMS Detectors:** The received signal tone is detected and measured by the averaging level detector; the noise level is detected and measured by the true RMS detector. Detector outputs are then applied to an analog-to-digital converter, whose digital output is conveyed to the CPU via the data bus.

3.5.3 **OPTIONAL STAGES:** The function of the optional P/AR and return loss measurement circuitry is described in the following sub-paragraphs:

(1) **P/AR Signal Measurement Option:** As shown in Figure 3-1, the P/AR signal is routed to the detection stage via the main path. The signal is then passed through a 1300 Hz bandpass filter, an average detector, and a peak detector. The peak and average detected outputs are then transferred to a multiplexing stage and fed into an A/D converter. A/D converter output is routed to the CPU, where the P/AR is computed.

(2) **Return Loss Signal Measurement Option:** Return loss measurements may be performed on two-wire or four-wire circuits. The 2W or 4W Return Loss signal is detected and measured by the RMS detector; it is then expressed as the ratio of the transmitted power to the reflected power. In a two-wire

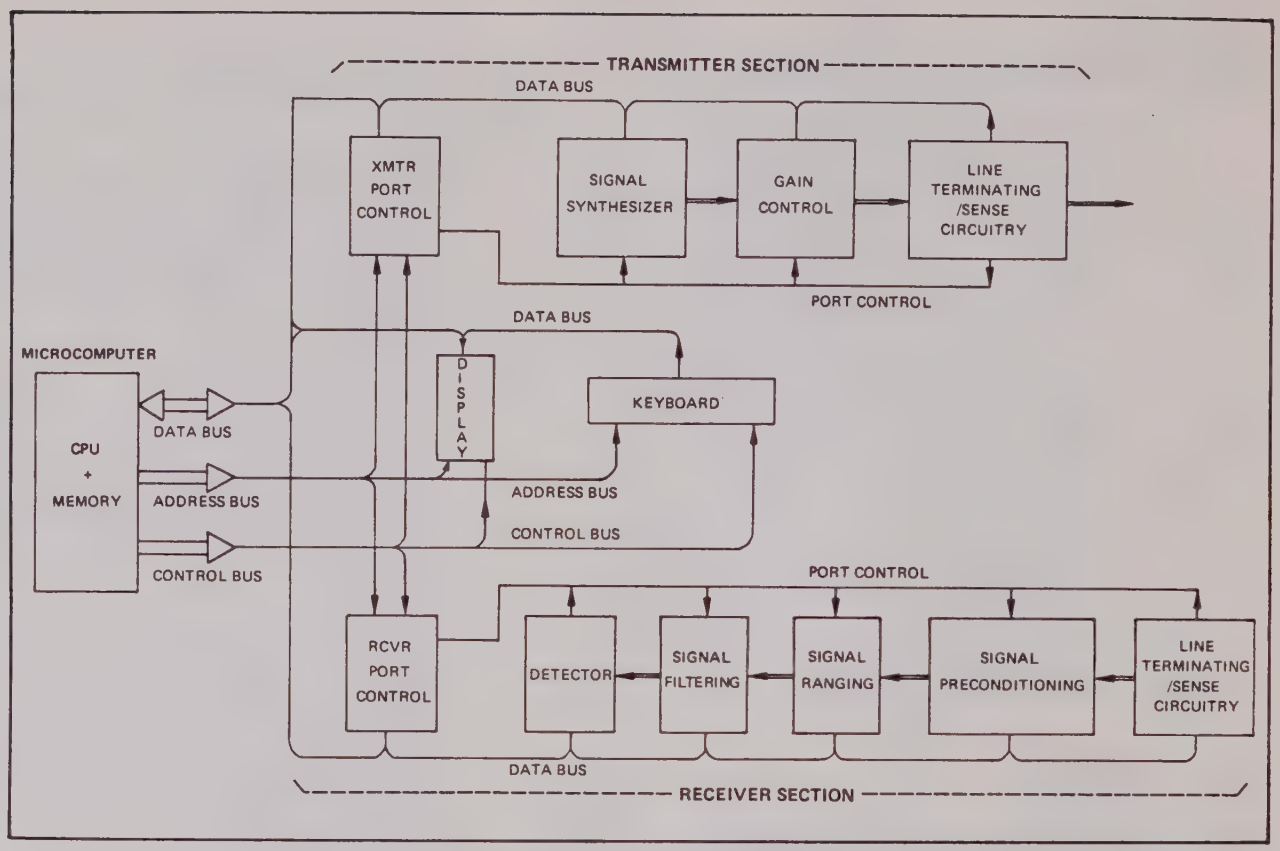


Figure 3-2. Interface Connections

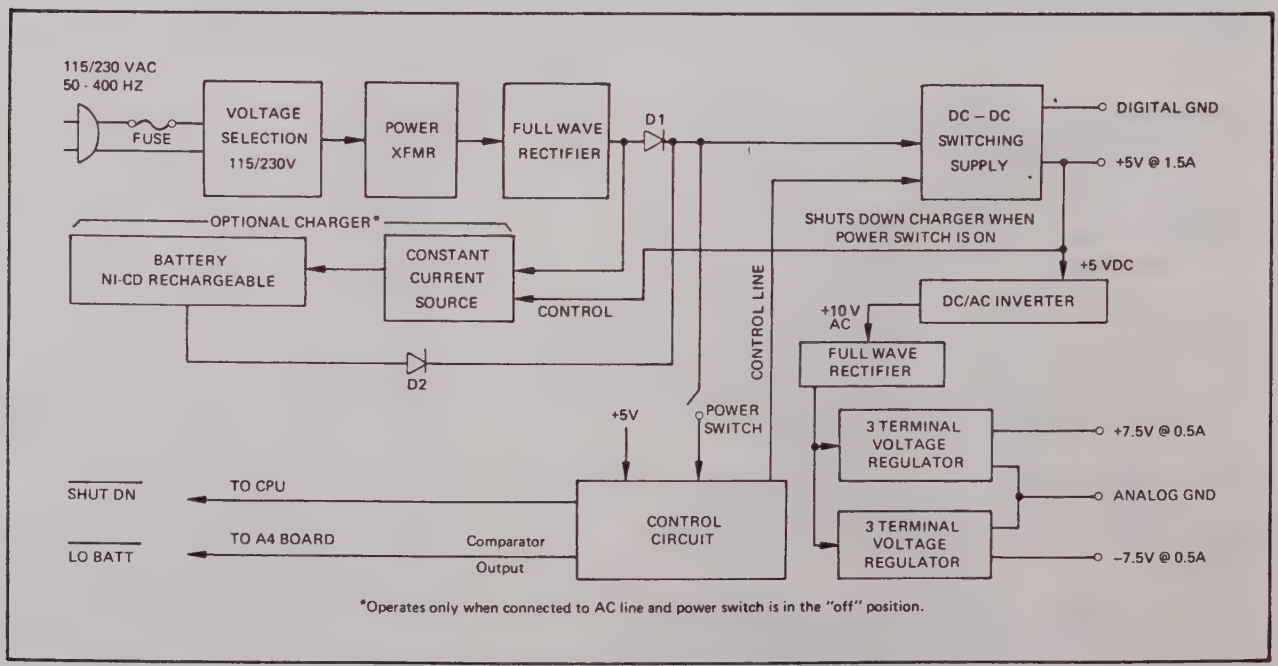


Figure 3-3. 812A Power Supply Circuits

circuit, energy is reflected back to the transmitter; in a four-wire circuit, energy is reflected back toward the receive side of the line.

As Figure 3-1 shows, the RL 2W+ signal is applied to the differential amplifier simultaneously with the RL 2W- signal.

3.6 MICROCOMPUTER

3.6.1 The microcomputer controls all the major functions of the test set, including the Transmitter, Receiver, Keyboard, and Display. It interfaces with these major functional sections via the data and address buses (as well as via a control bus in the case of the Keyboard), as can be seen in Figure 3-2. The microcomputer itself consists of the Central Processing Unit (CPU) and two types of memory: (1) a Programmable Read-Only Memory (PROM) and a Random Access Memory (RAM).

3.7 DISPLAY

3.7.1 The 812A has two separate displays for FREQ/TIME and LEVEL/COUNTS indications; each display window contains four seven-segment liquid crystal displays (LCDs). In addition, 12 LCD bar displays provide instrument status information.

The display is switched automatically from "transmit" to "receive" as required to show measured values. Transmit parameters can be checked by manually operating the TRMT/RCV Key.

3.8 POWER SUPPLY

3.8.1 The 812A can be powered by 115/230 VAC, or by an optional rechargeable battery pack. (Figure 3-3 provides a block diagram of these power supply circuits.) If the battery pack has been installed, the test set automatically switches over to battery operation whenever it is disconnected from the AC source.

3.8.2 For AC operation, a full-wave rectifier converts the 115/230 VAC, 50–60 Hz input to a basic 28 VDC supply. When the power switch is OFF and the unit is plugged in, the 812A enters a standby mode while the optional battery pack is being charged. Turning the power switch ON activates the DC-DC converter, which produces a +5 VDC output. Simultaneously, a control signal shuts down the battery charger (if installed). Further, the +5 VDC is also applied to the DC/AC inverter, whose output is then applied to a full-wave rectifier; the rectifier outputs both +7.5 VDC and –7.5 VDC.

3.8.3 The charger provides a constant current of 450 mA to the optional battery pack. It requires approximately 14 to 16 hours to bring the 14.4 V nickel-cadmium battery pack to full charge from a low charge state. A fully charged battery pack provides a minimum of four hours operation.

3.8.4 The control circuit (see Figure 3-3) generates signals on the LO BATT and SHUT DN lines, while the control circuit voltage comparator continuously checks the battery voltage. When battery voltage falls below 13.6 V, the LO BATT signal triggers the low battery indicator; the indicator flashes to indicate that battery power will only last another 10 to 20 minutes. When battery voltage reaches 12 V, the instrument shuts off. The SHUT DN signal prevents memory contents from being corrupted by transients created when the power switch is turned ON and OFF.

> *NOTE: If the test set is turned OFF during the low battery warning period, it will not reoperate on battery power without a recharge.*

3.8.5 The 812A test set also has a continuous battery backup designed to maintain the operating status in memory when the test set is turned off; this backup operates for a minimum of two weeks.

SECTION 4

OPERATING PROCEDURES

4.1 - GENERAL INSTRUCTIONS

This section explains in detail how the 812A operates as a standard test set. The test set has two distinct operational modes: (1) FUNCTION ENTRY and (2) TEST.

Material in this section is arranged by functions. Each functional description provides detailed FUNCTION ENTRY and TEST instructions.

4.1.1 FUNCTION ENTRY MODE:

Individual test variables are selected in this mode: the test set is not measuring any values and the transmitter is 'OFF.'

The LEDs on the FUNCTION and ENTRY keypads prompt selection of new test parameters; a flashing display indicates the value of the parameter currently in memory. Test parameters are stored in memory only when the ENTER key is depressed.

The test set program controls the sequence in which parameters are selected. If parameter values do not change, the sequence can be advanced using the ENTER key.

The 812A assumes that all level values entered are positive(+). To change the sign of the displayed numeric value, the +/- key must be used. To correct an error, the CLEAR key is used.

QUICK REFERENCE INDEX

Page	Paragraph	Function
4-4	4.3	LEV/ FREQ
4-6	4.4	ATTN DISTORTION
4-8	4.5	NOISE
4-9	4.6	S/N
4-10	4.7	NOISE TO GROUND
4-11	4.8	IMPULSE NOISE
4-13	4.9	P/AR
4-13	4.10 & 4.11	RETURN LOSS 2W/4W

4.1.2 TEST MODE: Test mode is entered by pressing the EXECUTE key, thereby initiating the selected test functions. Both the transmitter and receiver are active in this mode; the display shows the values being measured. When a selected FUNCTION key is depressed again, or a new FUNCTION key is selected while the set is in TEST mode, the test in progress immediately stops.

The SWP HOLD and EXEC keys control both the transmitter and the receiver; the SET REF key controls the receiver alone.

NOTE: The VOL UP and VOL DOWN keys adjust speaker volume in 4 dB steps, and are only active in TEST mode.

4.2 INITIAL SETUP AND CONFIGURATION

4.2.1 TURN ON PROCEDURE: The 812A requires an operating voltage of 115/230 VAC (see Section 5), as indicated on the nameplate. Optional rechargeable batteries are also available.

Step 1: Connect power cord to receptacle on back of test set, and then to AC line source.

CAUTION

Voltage shown on plug-in card must match line source voltage. Failure to match voltages can result in serious damage to the test set.

Step 2: Push in the red button to switch on the power. The set will initialize itself and perform an automatic self-test.

During the self-test, if any internal problems are encountered, an error condition is returned; errors are displayed in the form: "EXX," where "XX" corresponds to the error numbers shown in Table 7-2. If the problems encountered are sufficiently extensive or serious, all "8s" and the software revision number are displayed; in such a case, the set cannot be used for further test procedures. If the problems encountered are sufficiently minor or localized, the set will be operable, but its performance may be degraded and errors may occur.

4.2.2 TEST SET CONFIGURATION

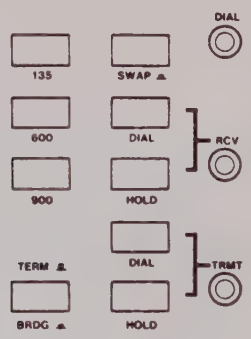


Figure 4-1. Configuration Controls

Step 1: Match the impedance of the set to the impedance of the circuit being tested. Normal impedance is 600 ohms; however, if 135 or 900 ohms impedance is required, press the appropriate pushbuttons.

Step 2: If the Receiver is to be used as a monitor, push the TERM/BRDG pushbutton in (BRIDGING). Normally, measurements are made in the TERMINATED mode, i.e., pushbutton out.

Step 3: Connect the circuit to the appropriate jacks on the front panel of the test set as follows:

a. Connect a four-wire circuit to the RCV and TRMT jacks.

b. Normally, connect a two-wire circuit to the RCV jack.

Step 4: The Port Swap facility applies to two-wire circuits only. Manually operate the SWAP button to interchange the Transmit and Receive ports.

4.2.3 DIAL-UP A CONNECTION

Proceed as follows:

Step 1: All the switches–DIAL, HOLD, and SWAP– should be released before connecting a circuit to the input jacks.

Step 2: a. Plug the telephone handset into the DIAL jack.

b. Plug the line to be tested into either the TRMT or the RCV jack.

Step 3: Push the associated DIAL switch to the ON position. The measurement circuits of the 812A are disconnected from the line, and the line is connected directly to the telephone handset. The telephone handset can now be used to establish a DDD connection, or if the connection has already been made, it can be used to communicate with the operator at the other test set. If the handset is being used for communication only, skip to Step 6.

Step 4: If the handset is being used to establish a DDD connection, dial the desired number with the handset.

Step 5: After a connection has been established, depress the appropriate HOLD switch; then release the DIAL switch. The holding current is maintained by the 812A's holding circuit, while the line is reconnected to the measurement circuitry.

Step 6: Now proceed with testing as described in the test procedure. If the Port Swap is to be used, make sure both HOLD switches are depressed and both DIAL switches are released; then press the SWAP switch. To release the line, release the HOLD switches.

TEST PROCEDURE

Each of the TEST functions is described in the following pages. Included are step-by-step instructions describing parameter selection and TEST mode procedures.

Whenever a key is pressed, the following three things occur:

1. The LED associated with the selected key lights steadily.
2. A key LED or a number in the display window flashes, prompting the operator to make the next selection.
3. The display conveys numeric information about parameters.

Test parameters must be entered into the test set in the prompted sequence. Depressing the CLEAR key prior to using the ENTER key will clear any numeric values; pressing a selected test's FUNCTION key again and restarting the test will clear any previously selected test parameters. For a prompted sequence which does not need to be changed, push the ENTER key and proceed to the next parameter.

4.3 LEVEL AND FREQUENCY

The LEV/FREQ function key is used for circuit loss and frequency response tests.

4.3.1 SET CONFIGURATION: The transmitter consists of a tone source (1004 Hz, selected frequency, or swept frequencies), while the receiver is configured as a "flat" levelmeter. A low frequency noise filter is inserted, which rolls off the response starting at 200 Hz, unless the measured frequency is below 400 Hz. When the measured frequency is below 400 Hz, no filter is used.

4.3.2 PARAMETER SELECTION: The level and frequency of the signal to be transmitted are selectable. The signal level is selectable within a range of -50 dBm to +10 dBm. The test signal can be a 1004 Hz test tone, a discrete tone frequency, SLOPE, or it can follow one of three frequency sweep plans: SWP A, SWP B, or SWP C. (All start at 1004 Hz, followed by the first frequency in the scan.) When using the programmable sweep (SWP C), Start Frequency, Stop Frequency, Step Size, and Skip Frequency are entered in sequence. To delete a Skip Frequency, enter zero.

The selection process is illustrated in Figure 4-2.

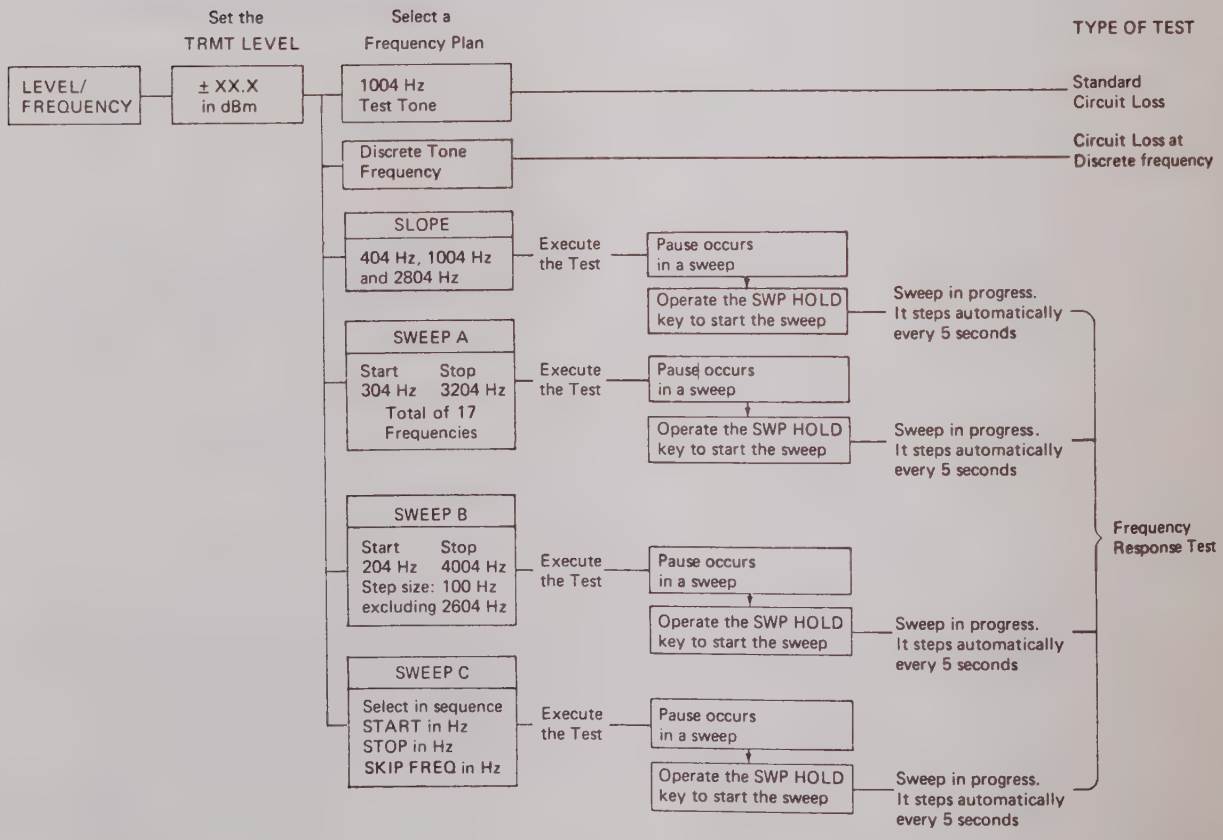


Figure 4-2. Selection Process for Level/Frequency Function

4.3.3 **TEST MODE INSTRUCTIONS:** To perform the test, press the EXECUTE key. When executing a test involving a sweep, depress the SWP HOLD key (after using the EXECUTE key) to start the sweep. To step the sweep forward one frequency, press the SWP HOLD key twice; to step the sweep backward one frequency, press the +/– key once.

The SWP HOLD key can be used to start/stop/step the sweep at any frequency in the sweep plan. When the sweep has been deactivated by the SWP HOLD key, pressing the key again will reactivate the sweep. When the sweep has been activated, pressing the SWP HOLD key will deactivate it. Two quick, successive depressions of the SWP HOLD key allow the sweep to forward-step to the next higher frequency within the sweep.

Either 1004 Hz or a discrete test tone is displayed for a Circuit Loss test. For a Frequency Response test, the signal level in dBm is displayed along with the corresponding signal frequency, thereby indicating attenuation variation with frequency.

The Level/Frequency function entry sequence is detailed in Figure 4-3.

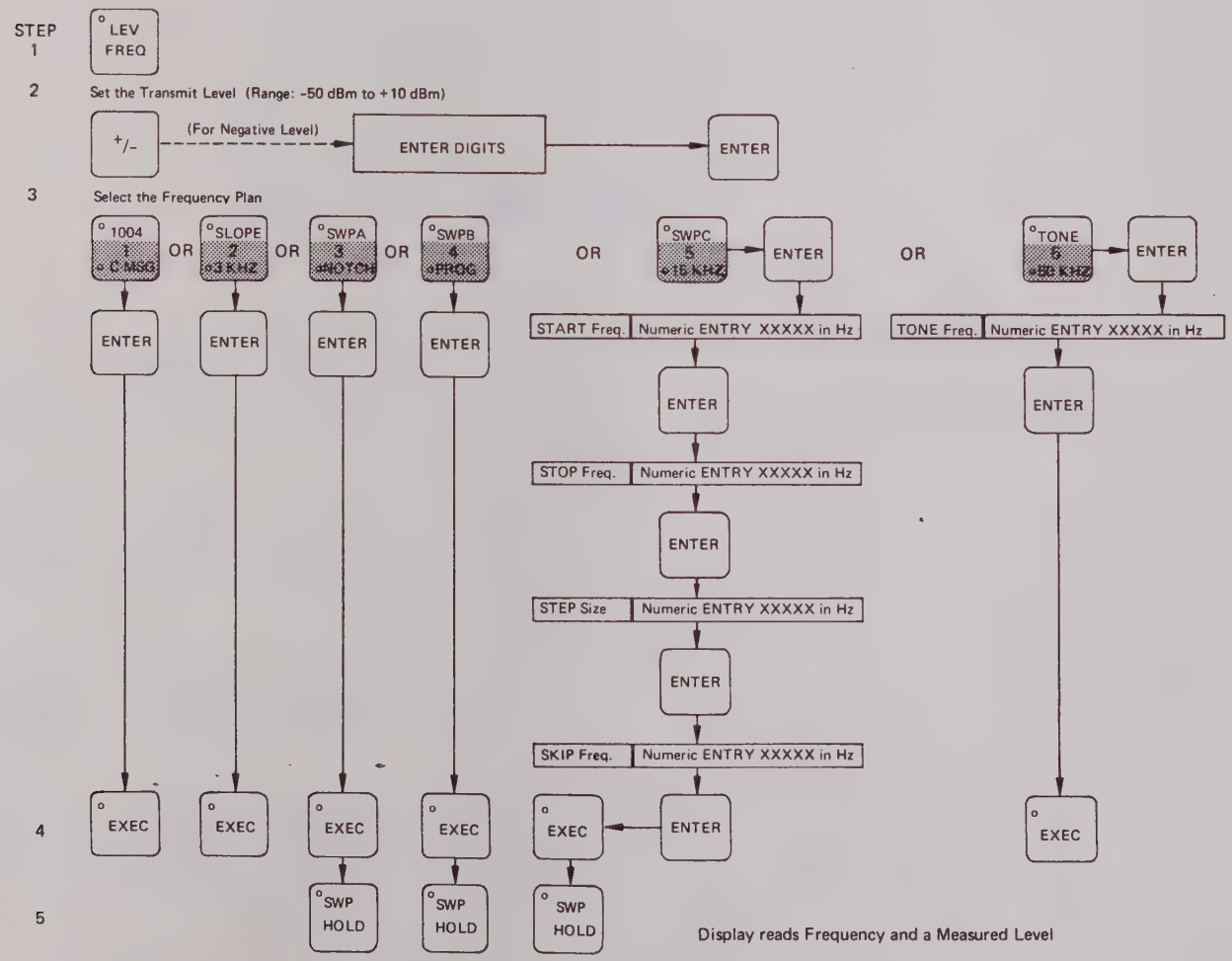


Figure 4-3. Level/Frequency Function Entry Sequence

4.4 ATTENUATION DISTORTION:

The ATTN DIST function key is used for Attenuation Distortion testing.

4.4.1 SET CONFIGURATION: The transmitter consists of a tone source (1004 Hz, a selected frequency, or swept frequencies), while the receiver is configured as a "flat" levelmeter. A low frequency noise filter which rolls off the response starting at 200 Hz is inserted, unless the measured frequency is below 400 Hz. When the measured frequency is below 400 Hz, no filter is used.

4.4.2 PARAMETER SELECTION: The signal level and frequency plan for the signal to be transmitted are selectable. The level is selectable within a range of -50 dBm to +10 dBm. The frequency plan can be SLOPE or one of three frequency sweep plans: SWP A, SWP B, or SWP C. When using the programmable sweep (SWP C), Start Frequency, Stop Frequency, Step Size, and Skip Frequency are entered in sequence. To delete a Skip Frequency, enter zero.

The selection process is illustrated in Figure 4-4.

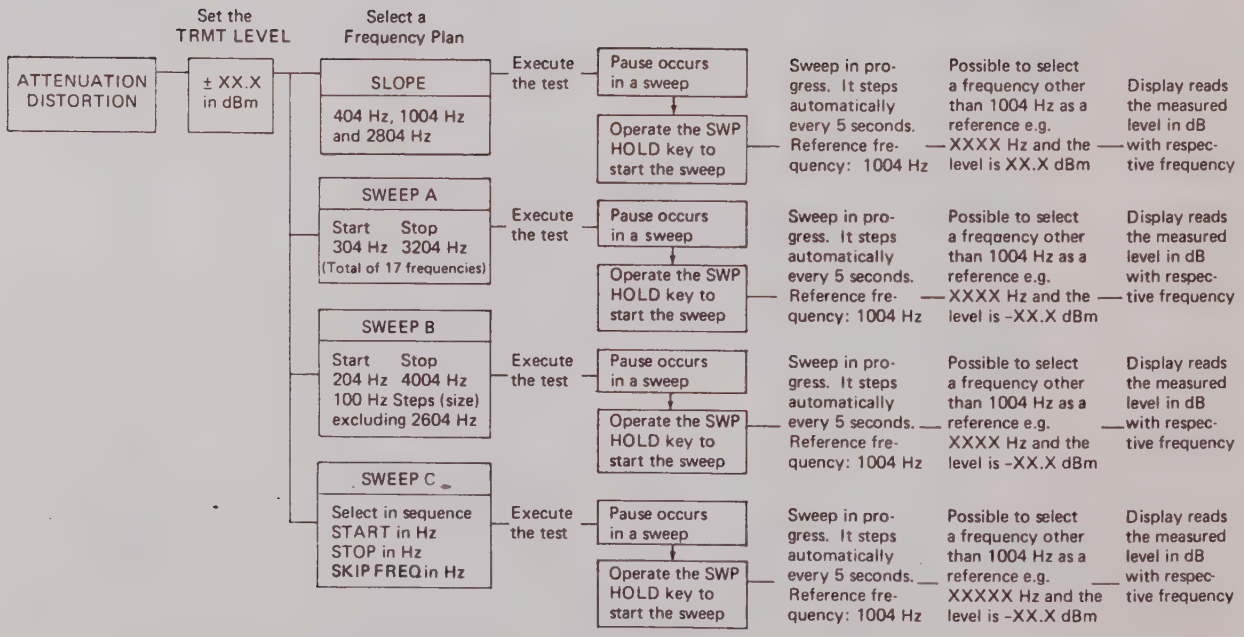
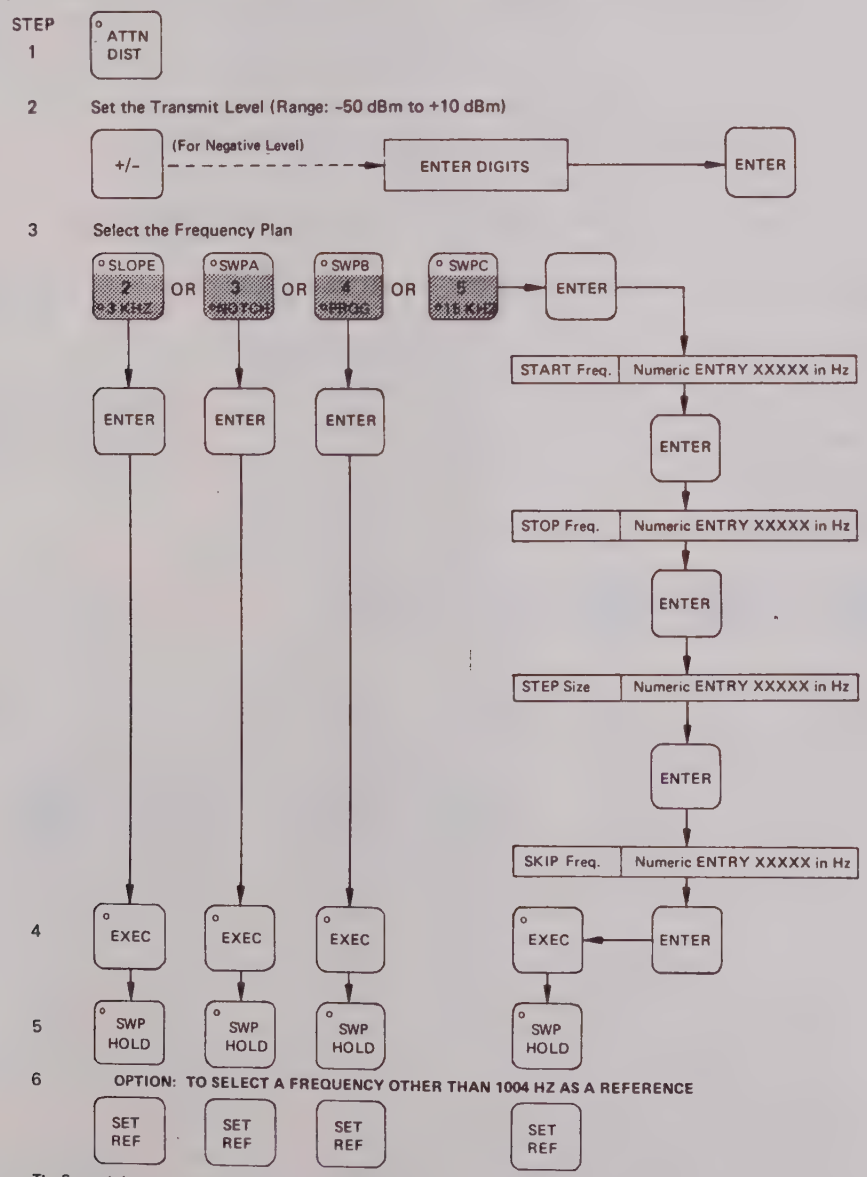

ATTENUATION DISTORTION
Set the TRMT LEVEL
± XX.X in dBm
Select a Frequency Plan
SLOPE
404 Hz, 1004 Hz and 2804 Hz
SWEEP A
Start Stop
304 Hz 3204 Hz
(Total of 17 frequencies)
SWEEP B
Start Stop
204 Hz 4004 Hz
100 Hz Steps (size)
excluding 2604 Hz
SWEEP C
Select in sequence
START in Hz
STOP in Hz
SKIP FREQ in Hz
Execute the test
Pause occurs in a sweep
Operate the SWP HOLD key to start the sweep
Sweep in progress. It steps automatically every 5 seconds. Reference frequency: 1004 Hz
Possible to select a frequency other than 1004 Hz as a reference e.g. XXXX Hz and the level is XX.X dBm
Display reads the measured level in dB with respective frequency
Possible to select a frequency other than 1004 Hz as a reference e.g. XXXX Hz and the level is -XX.X dBm
Possible to select a frequency other than 1004 Hz as a reference e.g. XXXXX Hz and the level is -XX.X dBm

Figure 4-4. Selection Process for Attenuation Distortion Function

4.4.3 **TEST MODE INSTRUCTIONS:** To perform the test, press the EXECUTE key. When executing a test involving a sweep, depress the SWP HOLD key (after using the EXECUTE key) to start the sweep. To step the sweep forward one frequency, press the SWP HOLD key twice; to step the sweep backward one frequency, press the +/- key once.

The SWP HOLD key can be used to start/stop the sweep at any frequency in the sweep plan. When the sweep has been deactivated by the SWP HOLD key, pressing the key again will reactivate the sweep. When the sweep has been activated, pressing the SWP HOLD key will deactivate it.

The first frequency transmitted is always 1004 Hz. If the SET REF key is not used, the first frequency received will automatically become the reference frequency. By depressing the SET REF key while the sweep is in progress, a reference frequency other than 1004 Hz can be selected. In the sweep cycle immediately following such a key action, test results will be adjusted accordingly, so that displayed values will be given in terms of the newly selected reference frequency.



The Sweep is in progress and the Reference frequency is 1004 Hz (Default Value). At the instance when SET REF key is operated, the frequency shown in the display becomes the new Reference frequency and the sweep is continued.

Figure 4-5. Attenuation Distortion Function Entry Sequence

4.5 NOISE: (Normal Mode)

The NOISE function key is used to measure circuit noise.

4.5.1 SET CONFIGURATION: The transmitter is not needed for this test, serving instead only as a quiet termination. The receiver comprises a selected weighting filter and a true RMS noise meter.

Noise can be measured with or without the NOTCH filter. To select the NOTCH filter and/or one of five different noise filters, follow the selection process shown in Figure 4-6.

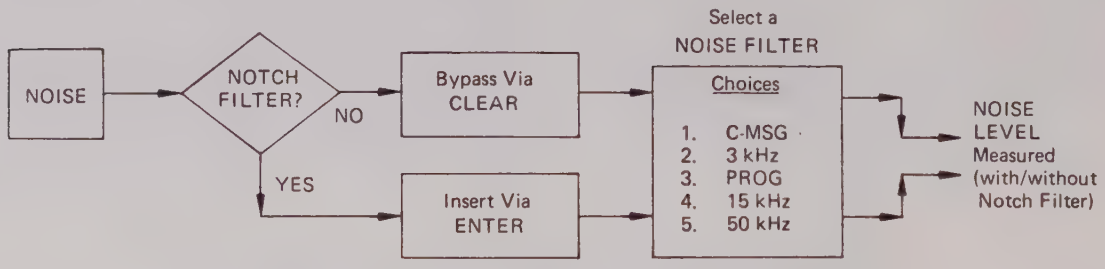


Figure 4-6. Selection Process for NOISE Function

4.5.2 TEST MODE INSTRUCTIONS:

To perform the test, press the EXECUTE key. The numeric display then shows the noise level in dBrn.

The noise function entry sequence is detailed in Figure 4-7.

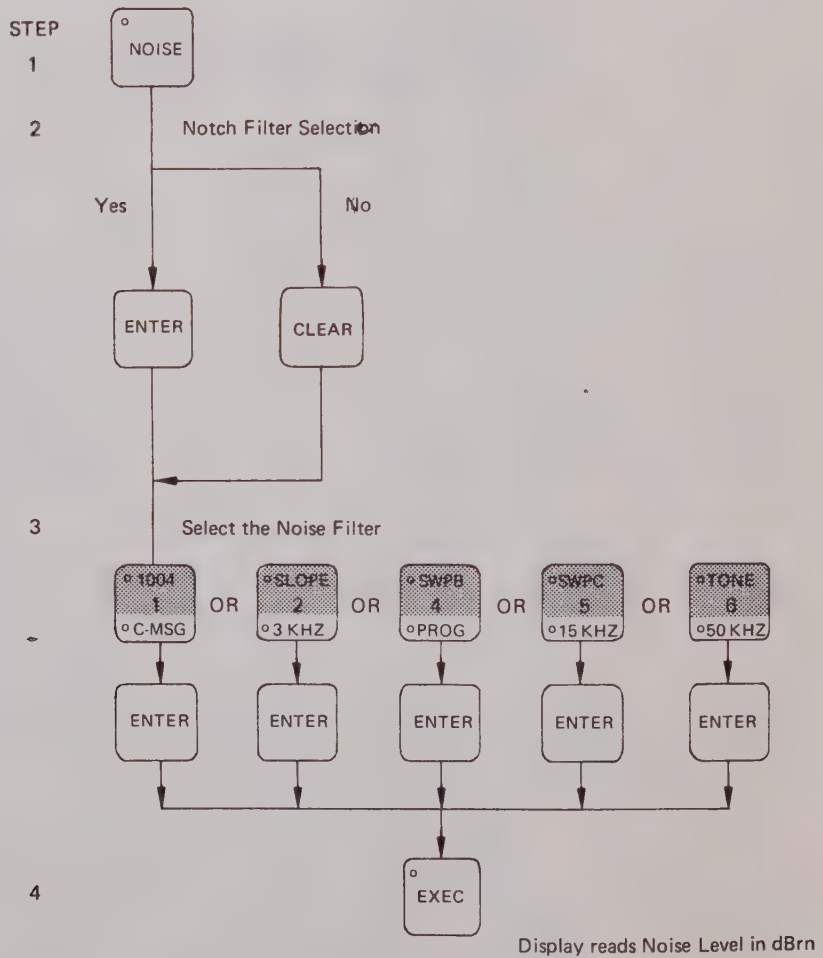


Figure 4-7. NOISE Function Entry Sequence

4.6 SIGNAL-TO-NOISE RATIO:

The S/N function key is used to obtain a direct reading of the Signal-to-Noise Ratio.

4.6.1 **SET CONFIGURATION:** The transmitter generates a 1004 Hz test tone, while the receiver is configured to act as both a level meter and a noise meter. The incoming tone level is measured to obtain the signal component; noise is measured by notching out the tone and using a noise weighting filter.

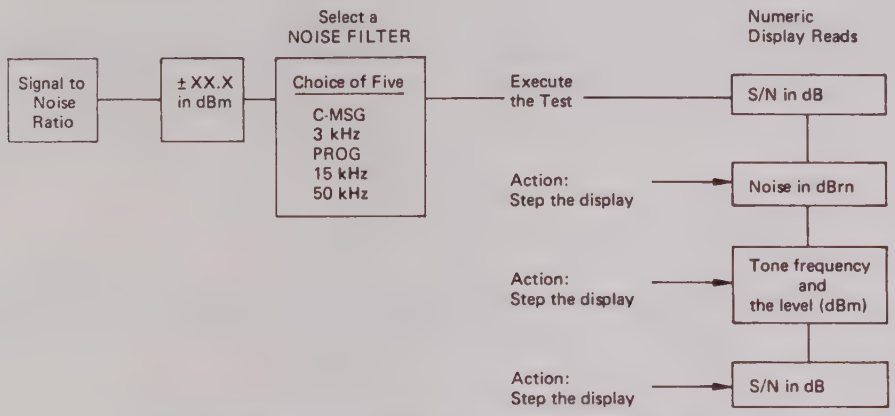


Figure 4-8. Selection Process for Signal-to-Noise Ratio Function

4.6.2 **PARAMETER SELECTION:**

The transmit level of the test tone and the noise weighting filter are selected. See Figure 4-8 for an illustration of the selection process.

4.6.3 **TEST MODE INSTRUCTIONS:**

To perform the test, depress the EXECUTE key; the signal-to-noise ratio is then displayed in dB. Notched noise is displayed (in dBrn) when the ADVANCE key is pressed. Pressing the ADVANCE key again causes tone level and frequency to be displayed. Pressing the ADVANCE key one more time causes the signal-to-noise ratio to be displayed again.

The S/N function entry sequence is detailed in Figure 4-9.

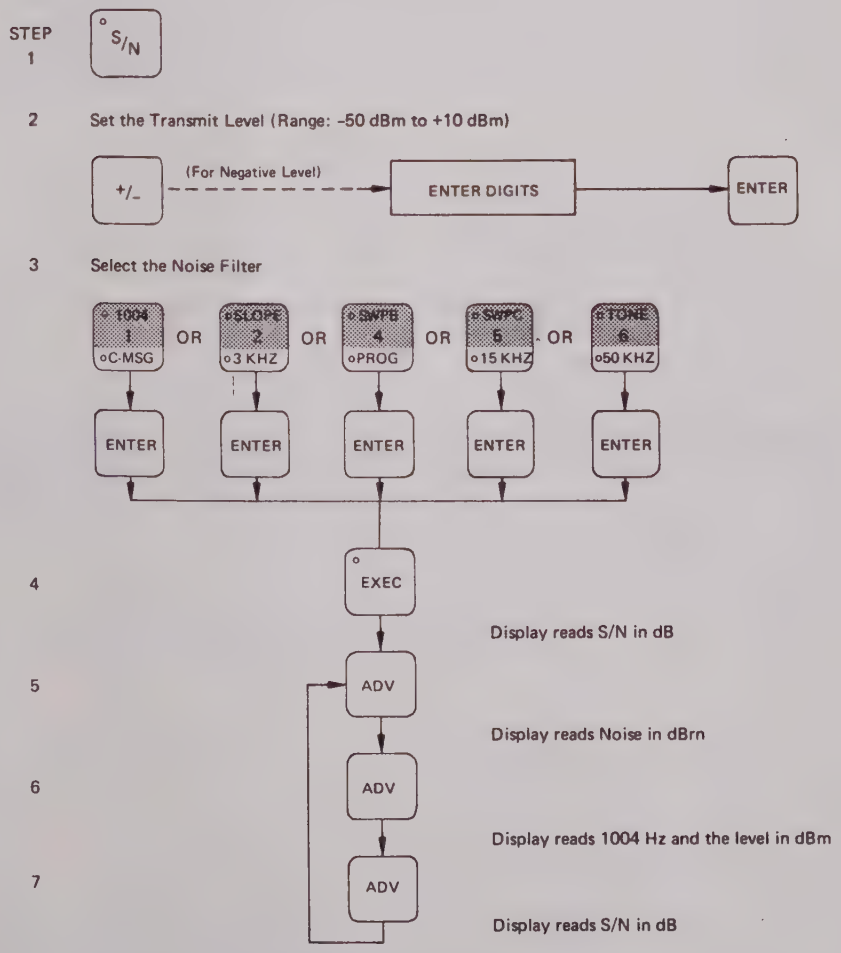


Figure 4-9. Signal-to-Noise Ratio Function Entry Sequence

4.7 NOISE-TO-GROUND: (Common Mode)

The N/G function key is used to measure the noise level when the line is unbalanced.

4.7.1 SET CONFIGURATION: The transmitter is not required and is used only as a quiet termination. The receiver unbalances the line to ground, routing the resultant signal through a selected weighting filter and a true RMS noise meter.

Five different noise filters are selectable (see Figure 4-10).

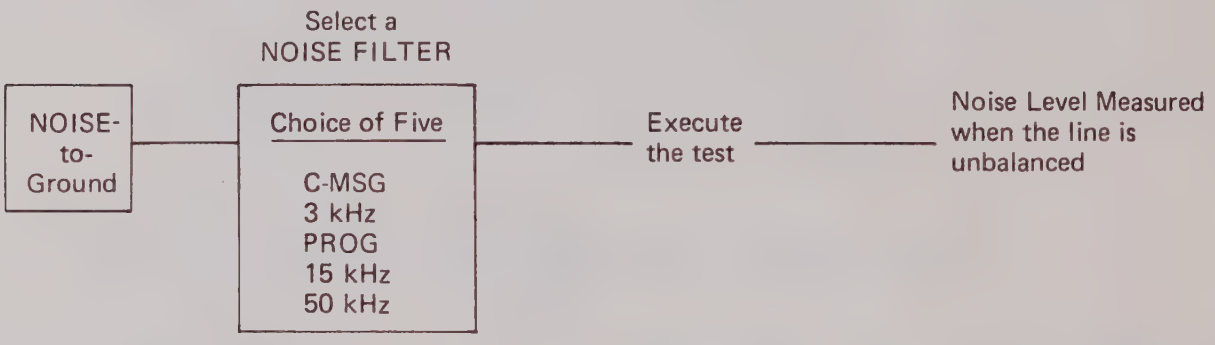


Figure 4-10. Selection Process for Noise-to-Ground Function

4.7.2 TEST MODE INSTRUCTIONS:

To perform the test, depress the EXECUTE key. The numeric display shows the noise level in dBrn.

See Figure 4-11 for the Noise-to-Ground function entry sequence.

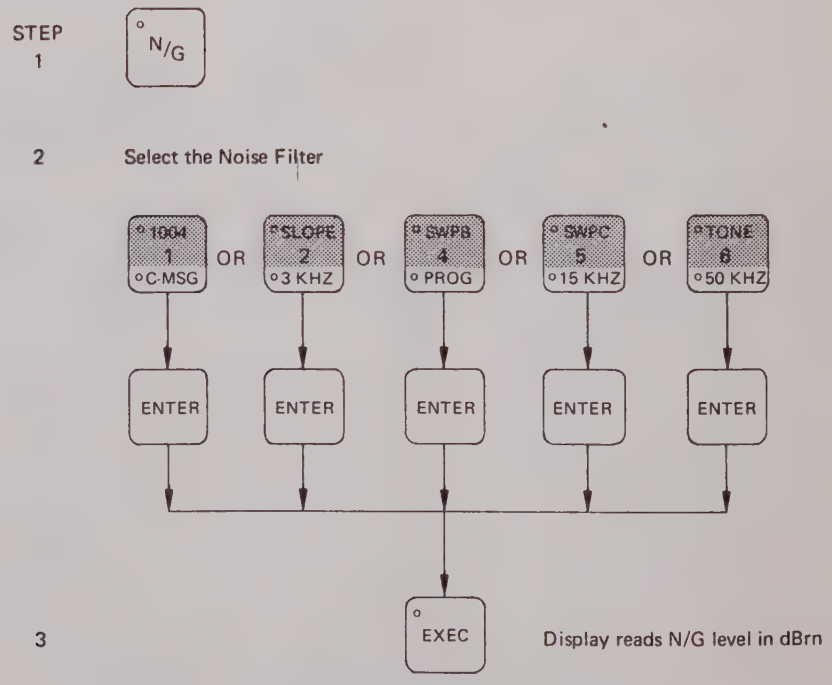


Figure 4-11. Noise-to-Ground Function Entry Sequence

4.8 IMPULSE NOISE:

The IMP NOISE function key measures impulse counts at three levels—Low, Mid, and High.

4.8.1 SET CONFIGURATION: The transmitter generates a 1004 Hz tone; the receiver circuits recognize impulse noise and maintain a count of impulses.

4.8.2 PARAMETER SELECTION: Notch filter, tone, transmit level, noise filter, threshold level, count rate, and count time are all selectable.

Figure 4-12 illustrates the selection process.

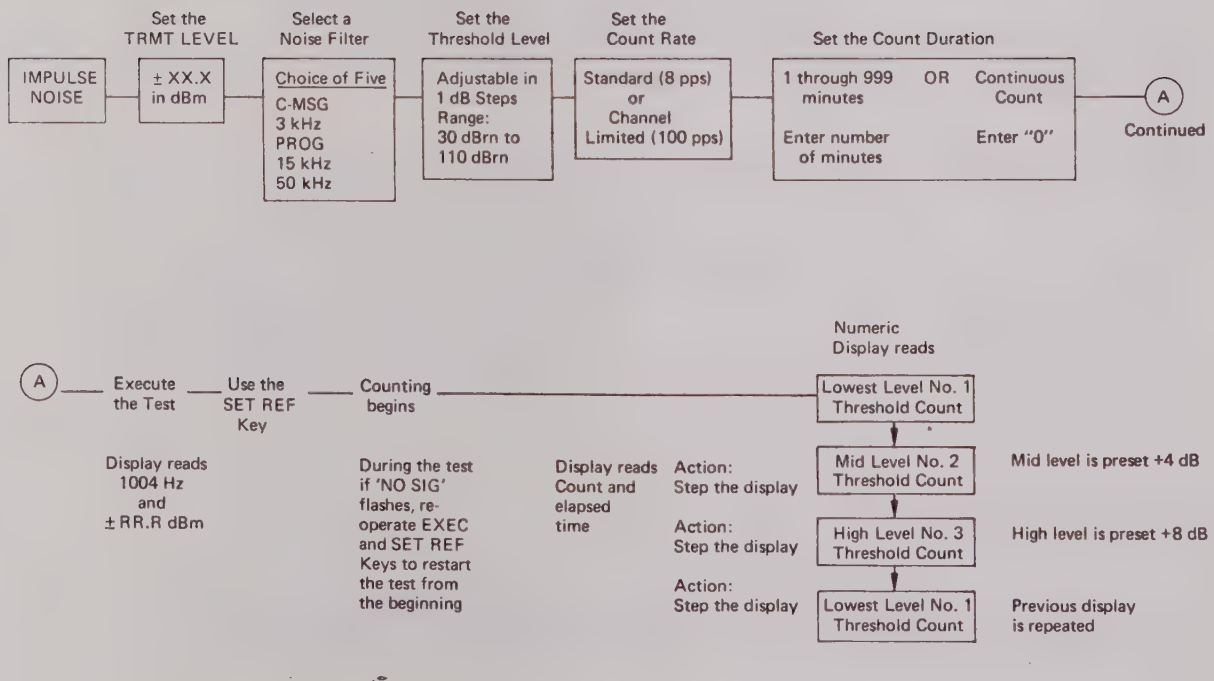

Set the TRMT LEVEL
Select a Noise Filter
Set the Threshold Level
Set the Count Rate
Set the Count Duration
IMPULSE NOISE
± XX.X in dBm
Choice of Five
C-MSG
3 kHz
PROG
15 kHz
50 kHz
Adjustable in 1 dB Steps Range: 30 dBrn to 110 dBrn
Standard (8 pps) or Channel Limited (100 pps)
1 through 999 minutes
OR
Continuous Count
Enter number of minutes
Enter "0"
A
Continued
A
Execute the Test
Use the SET REF Key
Counting begins
Numeric Display reads
Lowest Level No. 1 Threshold Count
Display reads 1004 Hz and ± RR.R dBm
During the test if 'NO SIG' flashes, re-operate EXEC and SET REF Keys to restart the test from the beginning
Display reads Count and elapsed time
Action: Step the display
Mid Level No. 2 Threshold Count
Mid level is preset +4 dB
Action: Step the display
High Level No. 3 Threshold Count
High level is preset +8 dB
Action: Step the display
Lowest Level No. 1 Threshold Count
Previous display is repeated

Figure 4-12. Selection Process for Impulse Noise Function

4.8.3 TEST MODE INSTRUCTIONS:

To perform the test, depress the EXECUTE key. Test duration is controlled by an elapsed-time clock, which starts running at the beginning of the test.

The left numeric display presents the clock time in minutes; the right numeric display shows the impulse noise level count. Further, the bar display indicates levels 1, 2, and 3 as the Low, Mid, and High levels, respectively. To step the display for reading other test results, press the ADVANCE key.

The Impulse Noise function sequence is detailed in Figure 4-13.

NOTE: If the received tone is less than –40 dBm, the test will not begin and the display will read "LO."

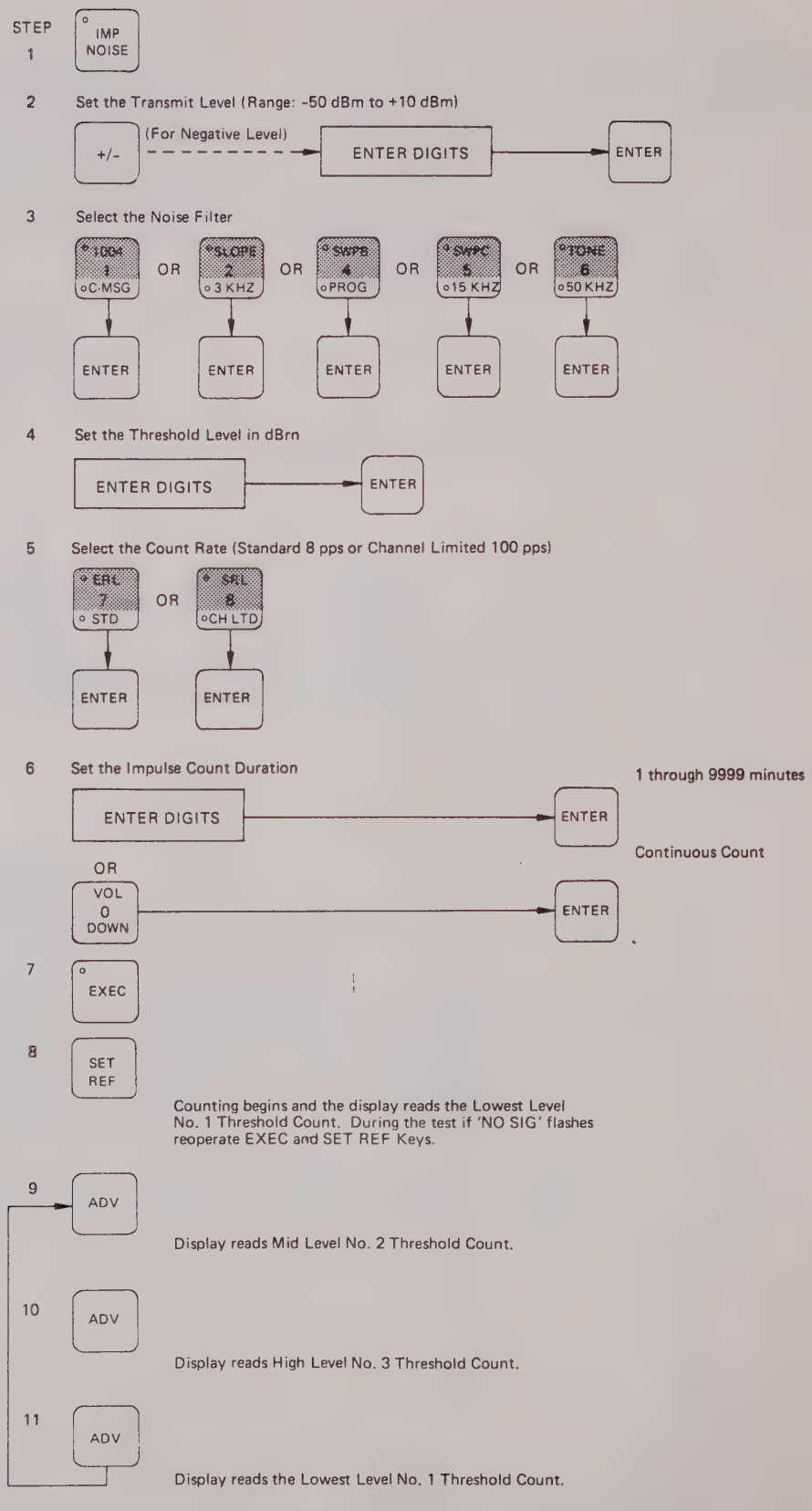


Figure 4-13. Impulse Noise Function Entry Sequence

4.9 PEAK-TO-AVERAGE RATIO (P/AR): (Optional)

4.9.1 SET CONFIGURATION: The transmitter generates a specially synthesized signal consisting of 16 non-harmonically related sine waves of known peak-to-average ratio. The receiver consists of circuits which measure signal dispersion in terms of reduced peak-to-average ratio. Envelope delay distortion, attenuation distortion, and noise are the primary factors affecting P/AR.

4.9.2 PARAMETER SELECTION: The transmit level of the output signal is the only selectable parameter. Maximum allowable value for the P/AR transmit signal is 0 dBm (Range: –40 dBm to 0 dBm).

The Peak-to-Average Ratio function entry sequence is detailed in Figure 4-14.

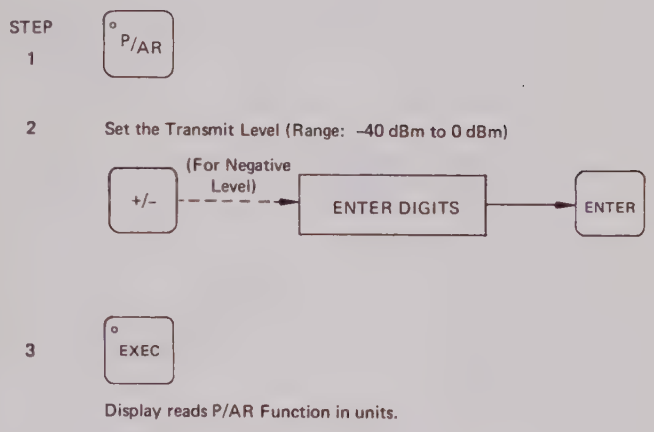


Figure 4-14. Peak-to-Average Ratio Function Entry Sequence

4.10 RETURN LOSS MEASUREMENT (FOUR-WIRE CIRCUIT): (Optional)

4.10.1 SET CONFIGURATION: The transmitter generates a shaped noise signal, while a test signal with a white noise band is limited by a selected weighting filter. Three transmit filters are available:

(1) Echo Return Loss (ERL)
560 Hz to 1965 Hz

(2) Singing Return Loss (SRL)
260 Hz to 500 Hz

(3) Singing Return Loss-High (SRL-HI)
2200 Hz to 3400 Hz

The receiver consists of a flat noise meter.

NOTE: If the 135-ohm or Bridging termination is used, a numbered error message is provided (see Table 7-2.).

4.10.2 PARAMETER SELECTION: The transmit level of the output signal, and the weighting filter, are both selectable.

See Figure 4-15 for the selection process and Figure 4-16 for the function entry sequence.

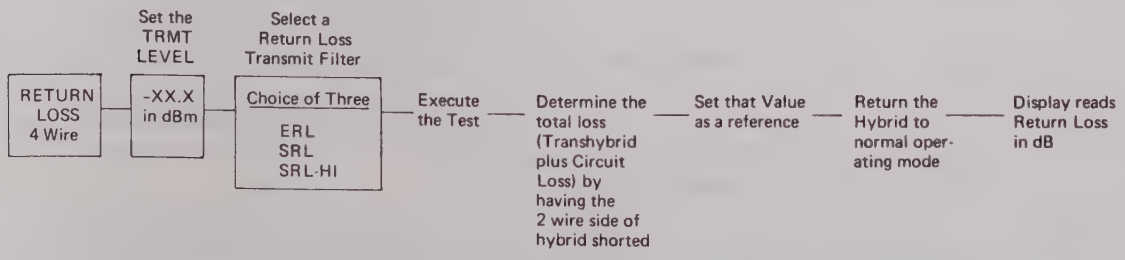

RETURN LOSS 4 Wire
Set the TRMT LEVEL
-XX.X in dBm
Select a Return Loss Transmit Filter
Choice of Three
ERL
SRL
SRL-HI
Execute the Test
Determine the total loss (Transhybrid plus Circuit Loss) by having the 2 wire side of hybrid shorted
Set that Value as a reference
Return the Hybrid to normal operating mode
Display reads Return Loss in dB

Figure 4-15. Selection Process for 4-Wire Return Loss Function

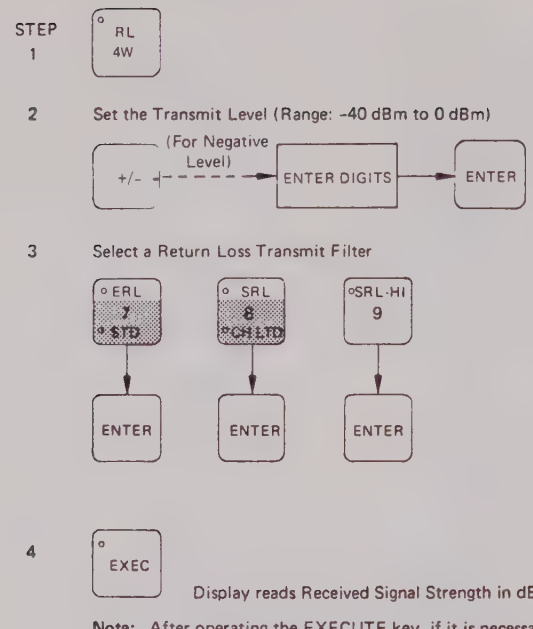


Figure 4-16. 4-Wire Return Loss Function Entry Sequence

4.10.3 **TEST MODE INSTRUCTIONS:** To perform the test, press the EXECUTE key. To make transhybrid loss (THL) the reference, zeroing the display, use the SET REF key.

4.11 RETURN LOSS MEASUREMENT (TWO-WIRE CIRCUIT): (Optional)

4.11.1 **SET CONFIGURATION:** The transmitter generates a shaped noise signal, while a test signal with a white noise band is limited by a selected weighting filter. Three transmit filters are available:

(1) Echo Return Loss (ERL)
560 Hz to 1965 Hz

(2) Singing Return Loss (SRL)
260 Hz to 500 Hz

(3) Singing Return Loss-High (SRL-HI)
2200 Hz to 3400 Hz

The receiver consists of a flat noise meter.

4.11.2 **PARAMETER SELECTION:** The transmit level of the output signal, and the transmit weighting filter, are both selectable.

See Figure 4-17 for the Two-Wire Return Loss function entry sequence.

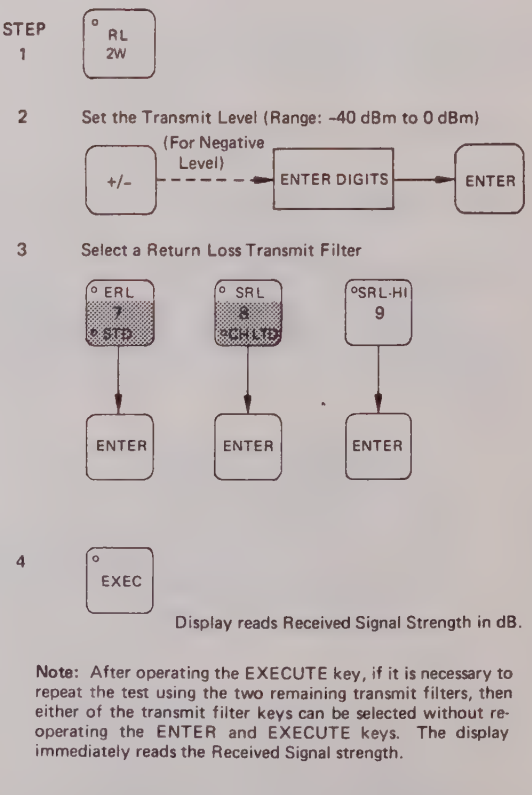


Figure 4-17. 2-Wire Return Loss Function Entry Sequence

4.11.3 **TEST MODE INSTRUCTIONS:** To perform the test, depress the EXECUTE key. The display shows return signal strength in dB.

SECTION 5

MAINTENANCE

5.1 RECEIVING INFORMATION

5.1.1 Inspect the test instrument carefully for possible shipping damage.

NOTE: It is suggested that the original shipping container and packaging materials be retained for instrument storage or for shipping.

Then verify the contents of the shipping container against the packing list.

5.1.2 If the instrument received is in damaged condition, immediately notify the carrier. If the order is incomplete, or the instrument fails to operate properly, contact the Sierra Customer Service Department at the following address:

Customer Service Department
Lear Siegler, Inc.
Sierra Electronic Division
3885 Bohannon Drive
Menlo Park, California 94025

Telephone: (415) 321-5374
TWX: 910-373-1282

5.2 REPAIR INFORMATION

5.2.1 Operator maintenance of the 812A is limited to line input voltage changes, fuse replacement, and cleaning. Calibration and maintenance should be performed at the Sierra factory, where specialized test equipment for the analysis of hardware/software malfunctions is available. Service and repair information may be obtained by contacting the Sierra Customer Service Department.

NOTE: If the instrument must be returned for repair, contact Sierra's Customer Service Department to obtain packing and shipping instructions, and a return authorization number.

5.3 TEST SET CLEANING

5.3.1 For normal cleaning of the 812A exterior, including the display face, use a damp cloth. Heavy grease spots can be removed using a cloth dampened with a mild detergent. Avoid getting excessive liquid on the cloth.

5.4 POWER REQUIREMENTS

5.4.1 The 812A operates from a 115/230 VAC, 60 Hz line source. Before operating the instrument, make sure that the voltage indicated on the plug-in card inside the power module (at the back of the test set) matches the line source, i.e., 115 or 230. To change the operating voltage, remove the plug-in card from the power module; then reinsert it, so that the proper designation is visible when the FUSE PULLER is in the normal position. If a voltage change is to be made, it will be necessary to change the fuse as well to the value shown in Table 5-1.

5.5 DISPLAY OF ERROR CODES

5.5.1 Errors will show up in the following cases:

(1) When a pushbutton is pressed while the set is running through the calibration and self-test process, an error code will be displayed.

(2) For the P/AR Function, either the 600 ohm or the 900 ohm termination must be selected; selection of the 135 ohm termination will cause an error display to be generated.

NOTE: The TERMINATE ■ (released) mode must be selected before the set runs through the calibration and self-test process.

(3) If part of the circuitry is out-of-tolerance (cf. Section 7, Appendix, Table 7-2 for Error Codes), an error display will be generated.

5.6 OPTIONAL BATTERY PACK

5.6.1 GENERAL: The optional nickel-cadmium battery pack requires no maintenance. If it is necessary to store a spare battery pack, be sure it is stored in a cool, dry place. The lower the storage temperature (20° C or lower), the longer the battery will retain its stored energy.

5.6.2 A fully-charged test set can be operated continuously for at least four (4) hours. When the battery voltage reaches 12V, discharge is terminated and the instrument shuts off.

5.6.3 When an instrument equipped with an optional battery pack frequently draws its power from an AC source, its battery pack will retain a full charge for a much longer time than would otherwise be the case. However, frequent use of an AC source will cause a temporary failure in the battery pack, i.e., the output voltage per cell will drop. This is a reversible condition which can be corrected by one or two full discharge/charge cycles.

5.6.4 BATTERY CHARGING: When the optional battery pack is installed, the 812A is also equipped with a built-in charger. To charge the battery pack, turn the POWER switch to OFF, and connect the instrument to an AC line source; the battery pack will be fully recharged in 14-16 hours.

5.6.5 BATTERY-IN-LINE FUSE: This is a normal blow 2A fuse, which can be reached by removing the bottom panel of the instrument. To replace the fuse, remove and retain the two screws from the bottom panel.

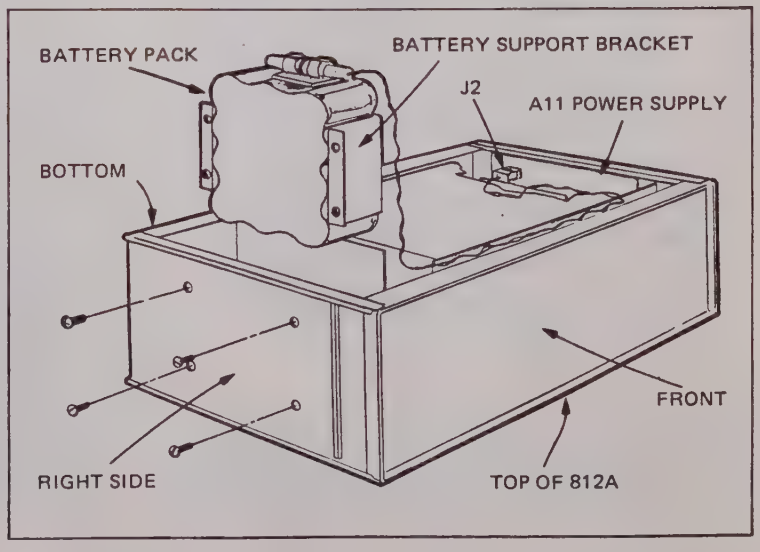
5.6.6 BATTERY PACK INSTALLATION PROCEDURES

1. Remove right side cover from Sierra 812A.
2. Turn Sierra 812A upside down and set it on its top.
3. Remove bottom cover from unit.
4. If unit already has battery, remove the battery support bracket by unscrewing the four screws that hold the bracket to the right side panel. Remove old battery pack.
5. Install battery pack in the bracket so that the leads are up, and with the fuse clips positioned as shown in figure 5-1.
6. Slide the battery pack and the bracket into position along the right side of the panel. Attach the bracket to the side panel with the screws, as shown.
7. Place the fuse holder (plastic-enclosed item in battery cable) in fuse clips, and run the battery harness along the front end of the unit. Plug the battery plug into jack J2 of the A11 power supply board, which is mounted on the left side panel.
8. Replace both bottom and side covers of the unit and return 812A to normal position.
9. Mark option label (located on back panel of 812A) with permanent type ink.
10. Charge the battery as instructed in paragraph 5.6.4.

Table 5-1. Field Replaceable Parts

Description	Sierra Part Number
Fuse, slow blow, 4/10A for 115 VAC	913200061
Fuse, slow blow, 2/10A for 230 VAC	913200055
Battery-in-line Fuse, normal blow 2A	913200058
Power Cord, detachable, 3-conductor	816400158
Rechargeable NiCad battery pack	918500026

Figure 5-1. Battery Installation



5.7 UNIT CALIBRATION

5.7.1 It is suggested that the instrument be calibrated on an annual basis, depending upon conditions and user requirements.

5.7.2 REQUIRED EQUIPMENT: The following equipment is needed to complete the calibration procedures (unless otherwise specified, the quantity is one):

- Small square-tip screwdriver
- Medium square-tip screwdriver
- Alignment tool (for adjusting pots)
- Adaptor (BNC female to standard double banana plug: Pomona 1269 or equivalent)
- Adaptor (BNC female to PJ-051/WE310 phone plug: Pomona 2789 or equivalent)
- 1 ft. Test cord (stackup standard banana plug each end: Pomona B12 or equivalent)
- 2 ft. Test cord (BNC male each end: Pomona BNC-B-24 or equivalent)
- 2 ft. Test Cord (310 phone plug each end - wired tip, ring and sleeve: Pomona 2524-J-24 or equivalent)
- Two 3 ft. Test Cords (310 plug to double banana plug & single banana plug: Pomona 2977-J-36 or equivalent)
- Extender Board (Sierra PN C03433200)
- Digital Voltmeter (DVM): HP 3455A or equivalent
- True RMS Voltmeter: Fluke 8920A or equivalent
- Oscilloscope: Tektronix 465B or equivalent
- Synthesizer/Function Generator: HP3325 or equivalent
- Volt/Ohm meter: Triplet 620, Type 3 or equivalent
- Dual Power Supply: HP 6205B or equivalent

5.7.2 PROCEDURE: For a complete calibration of the 812A Wideband Transmission Test Set, follow the instructions in Chart 5-A in sequence.

> NOTE: If any of the resulting values do not meet the requirements, do not continue with the procedure. Fix the problem and then restart the Calibration procedure.

CALIBRATION PROCEDURE
CHART 5-A

Step	Procedure
	Fuse and Voltage Selector Card
1	Check that fuse is of the appropriate amperage and that the filament is solid. Appropriate amperage for 115 VAC use is 4/10 Amp slo blow; for 230 VAC use it is 2/10 Amp slo blow.
2	Check the voltage selector card. This card is located below the fuseholder under the plastic cover beside the power cord receptacle. This card should have the number 120 visible when used on 115 VAC. (Or 240 on 230 VAC). The fuse puller must be in its normal position to see this number.
	Remove Covers
3	Remove the 6 normal head screws fastening the back plate to the rear panel. Remove the back plate.
4	Remove the 6 normal head screws fastening the bottom panel to the chassis. Remove the bottom panel.
5	Remove the 6 normal head screws fastening the top panel to the chassis. Remove the top panel.
	Check Voltages
6	Place the 812A upside down on the test bench.
7	Locate P2 on the A17 PWB (Holding Circuit). When facing the upside-down front panel of the 812A, the A17 PWB is located on the left side of the card cage.
8	Unplug P2 from the A17 PWB.
9	Remove all boards from the card cage and plug Extender Board into any of the vacant slots.
10	Connect power cord to unit and to AC outlet.
11	Turn 812A POWER switch to ON.
12	Set DVM to DCV and 200V.
13	Connect the ground or common lead of a DVM to the 812A chassis (preferably to bare metal).

(Procedure continued on next page)

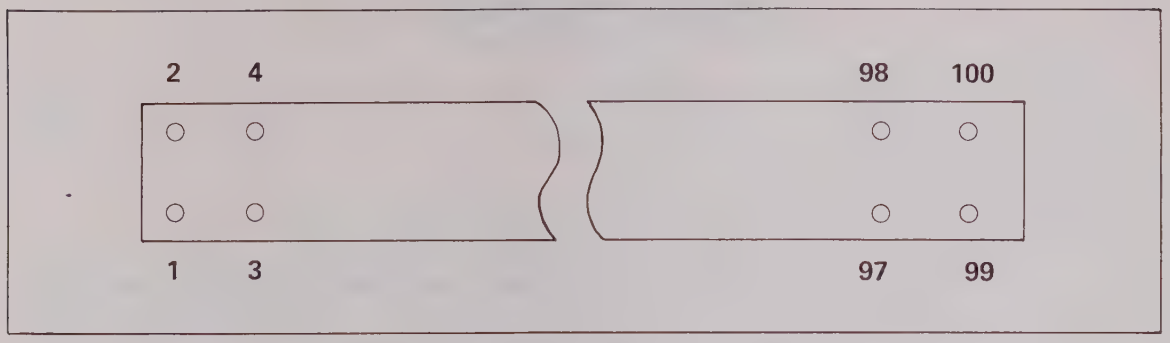


Figure 5-2. Extender Board Pin Numbering

CALIBRATION PROCEDURE
CHART 5-A

Step	Procedure
14	Using exposed pins of the Extender Board, check voltages as follows (see Fig. 5-2 for pin numbering on the Extender Board connector):

PIN	VOLTAGE	TOLERANCE
3,4,5,6	+5.0V	± 0.1V
95,96	+7.5V	± 0.3V
97,98	-7.5V	± 0.3V
99,100	+10.0V	

15	Turn 812A POWER switch to OFF.
16	Install all the boards into the card cage that were previously removed and plug in P2 on A17 Board.

Self-test

17	Turn 812A POWER switch to ON.
18	Verify that the 812A does a self-test and passes. If there are no ERROR CODES in the display, the printed circuit boards are performing correctly. (For more information on the self-test see pages 3-1 and 4-2 of this manual.)
19	If 812A is not going through the self-test, check the A1 Board (Central Processing Unit - CPU). Check that the EPROMs are plugged in correctly: seated snugly and observing polarity. Check that the dip switches are all in the ON position.
20	If errors occur during self-test, note ERROR CODES in the display and check with ERROR CODES list on page 6-4.

(Procedure continued on next page)

CALIBRATION PROCEDURE
CHART 5-A

Step	Procedure
	Fixed Gain Errors
21	If most of the errors are fixed gain errors, check that the transmitter is sending an output: set the frequency counter to x10, 10 kHz. Set the RMS Voltmeter to the following settings: db, AUTO, AC, dBm, 900 Ohms. Set the 812A to 900 Ohms.
22	Use the test cord with 310 to BNC male and plug the 310 end into the 812A TRMT jack; plug the BNC male end into the oscillator.
23	Set SWAP and DIAL switches to OUT position.
24	Perform a level/frequency test. (For more information on the level/frequency test, see Section 4, Operating Procedures.)
25	Verify that the frequency counter reads 1004 Hz and that the oscillator reads 0 dBm.
26	If there is no output, check the path from the transmitter board to the interface boards. NOTE: The transmitter output is a balanced signal.
27	If the transmitter is sending an output, plug a 310 to 310 test cord into the TRMT jack and RCV jack.
28	Touch the probe of the oscilliscope at TP1 of the A4 Board and verify that there is a 1004 Hz signal waveform. If not, trace the signal through interface boards A13 and A14 to A5A and A5B receiver boards. Find out where the signal disappears.
	Connection P11 (Front Panel to A13 Board)
29	Connect a 310 to 310 test cord between the TRMT and RCV jacks.
30	Perform a Level/Frequency test, 1004 Hz 0 dBm.
31	The display should read 1004 Hz 0dBm ±0.1 dB. If the display reads "LO", check P11 between the Front Panel to the A13 Board.
32	Change the impedance on the 812A to 600 Ohms.

(Procedure continued on next page)

Step	Procedure
33	Verify that the display reads 1004 Hz 0 dBm, ±0.1 dB.
34	Change the impedance on the 812A to 135 Ohms.
35	Verify that the display reads 1004 Hz 0 dBm, ±0.1 dB.
36	Push in the TERM/BRDG switch.
37	Verify that the display reads 6.0 dBm ±0.2 dB.
38	Turn the power switch on the 812A OFF and then turn it back ON. (The TERM/BRDG switch is still set to BRDG.)
39	Verify that the 812A passes the self-test.
40	If it does not pass the self-test, check that connector P11 is plugged in properly and repeat the Level/Frequency test.
41	Verify that when the TERM/BRDG switch is set to TERM, the display reads 1004 Hz 0 dBm ±0.1 dB and when it is set to BRDG, the display reads 6.0 dBm ±0.2 dB.
Adjusting R57 on the A5B Board	
42	Turn the 812A power switch to OFF.
43	Pull the A5B Board out of the card cage.
44	Insert the Extender Board in the A5B slot.
45	Insert the A5B Board into the Extender Board.
46	Turn the 812A POWER switch to ON.
47	Set the impedance to 900 Ohms and the TERM/BRDG switch to TERM on both the RMS Voltmeter and the 812A.
48	Set the synthesizer to 1004 Hz 0 dBm.
49	With a RMS Voltmeter on a tee connector, insert a 1004 Hz 0 dBm from a synthesizer to the RCV jack of the 812A. (Refer to Fig. 5-3 on the following page.)

(Procedure continued on next page)

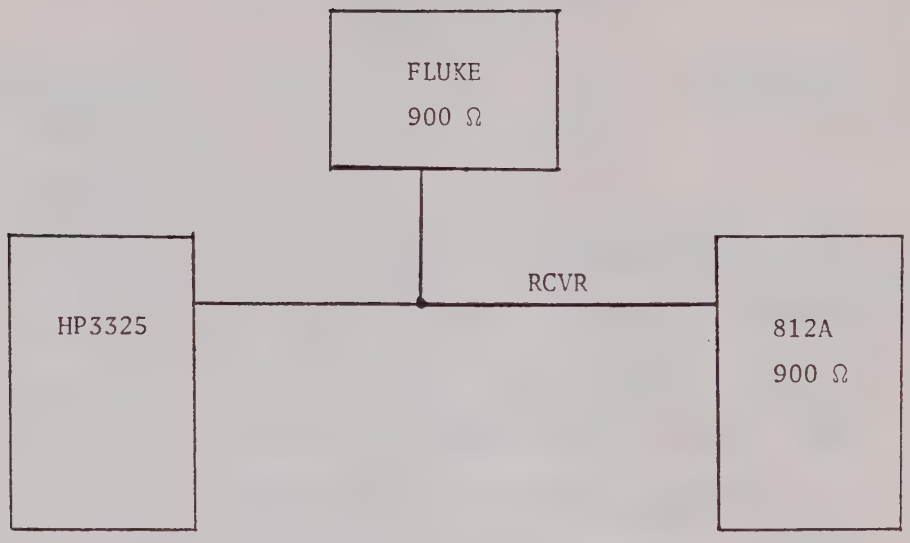


Figure 5-3. Test Setup for Adjusting R57 on the A5B Board

CALIBRATION PROCEDURE
CHART 5-A

Step	Procedure
50	Perform a Level/Frequency test with the 812A display set to RCV.
51	Using the alignment tool, adjust R57 on the A5B Board to read the same as the RMS Voltmeter ±0.05.
52	Turn the unit OFF.
53	Install the A5B Board back in the unit without the Extender Board.

NOTE: There are two tests for the Holding Circuit. The second one requires the use of two handsets, a telephone line and another person at the other end of the dial up line. If these are not available, perform the first test (immediately following this note). It is necessary to pass only one of these tests for the Holding Circuit.

(Procedure continued on next page)

Step	Procedure
	Testing the Holding Circuit without a handset and phone line
54	Set power supply to 36V and .075 Amp.
55	Turn 812A to ON.
56	Connect the two cables which have 1 end 310 and the other end a double banana plug and a single banana plug (ground strap). Plug one double banana into the side of the other double banana. Plug the ground strap of one into the ground strap of the other.
57	Connect the positive plug of double banana into the positive outlet on the power supply.
58	Plug ground plug into ground jack on the power supply.
59	Connect a jumper (stackup standard banana plug each end) from negative jack on double banana to negative outlet on power supply.
60	Plug the 310 plugs into the 812A TRMT and RCV jacks. (It doesn't matter which plug goes into which jack.)
62	Push in the TRMT HOLD button.
63	Verify that the power supply reads 20 mA.
64	Push in the TRMT DIAL button.
65	Verify that the power supply continues to read 20 mA.
66	Push in the RCV HOLD button.
67	Verify that the power supply reads 40 mA.
68	Push in the RCV DIAL button.
69	Verify that the power supply continues to read 40 mA.
70	Push in the SWAP button.
71	Verify that the power supply continues to read 40 mA.

(Procedure continued on next page)

CALIBRATION PROCEDURE
CHART 5-A

Step	Procedure
	Testing the Holding Circuit with a handset and phone line
	NOTE: This test is not required if the Holding Circuit passed the previous test.
72	Turn 812A POWER switch to ON.
73	Plug a telephone handset into the DIAL jack.
74	Plug a telephone line into the RCV jack.
75	Set the 812A to 600 Ohms, TERM.
76	Push in DIAL button of the RCV jack.
77	Pick up the handset and verify that there is a dial tone.
78	Dial a phone number.
79	When called number is answered, push HOLD button of the RCV jack, release the DIAL button on the RCV jack, push SWAP button, verify that there is a dial tone on the other end of the line.
80	Disconnect the telephone line from the RCV jack.
81	Insert the telephone line into the TRMT jack.
82	Push in DIAL button of the TRMT jack.
83	Dial a phone number.
84	When called number is answered, push HOLD button of the TRMT jack, release the DIAL button on the TRMT jack, release SWAP button, verify that there is a dial tone on the other end of the line.
	Adusting R69 on the A4 Board
85	Turn the 812A OFF.
86	Pull the A4 Board out of the card cage.
87	Insert the Extender Board into the A4 slot.
88	Insert the A4 Board into the Extender Board.

(Procedure continued on next page)

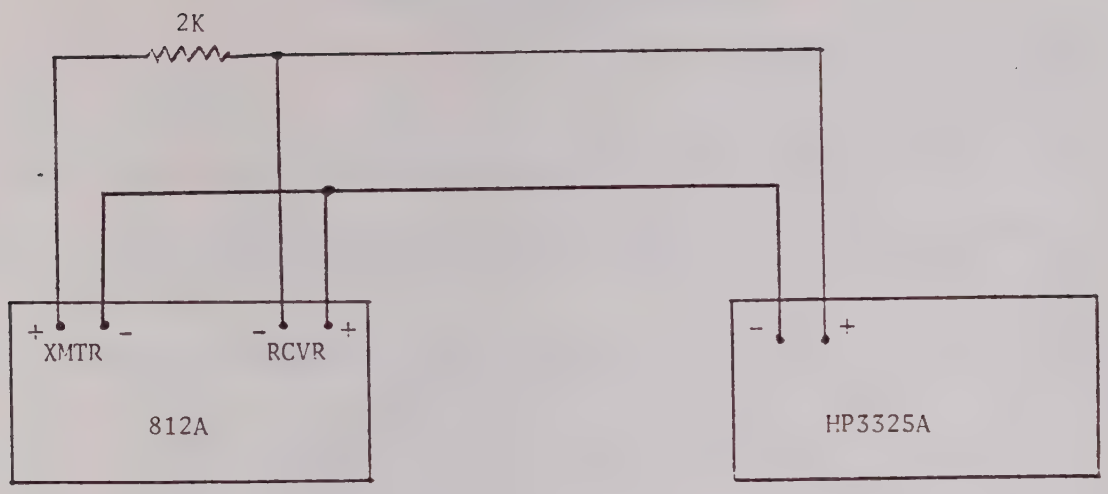


Figure 5-4. Test Setup for Adjusting R69 on the A4 Board

CALIBRATION PROCEDURE
CHART 5-A

Step	Procedure
89	Connect the TRMT and RCV jacks of the 812A. (See Figure 5-4 for more information.) Use the following test cords and adaptor: Test cord: (2) double banana to 310 phone plug T connector on the RMS Voltmeter Test cord: BNC male each end Adaptor: BNC female to standard double banana plug
90	Set the synthesizer to 1800 Hz, -19 dBm.
91	Set the 812A to the following: Test — IMPL NOISE 1004 Hz Level — +9.3 dBm Filter — C-MSG Threshold — 59 dBrn Count Rate — CH LTD Timer — 0 Min Impedance — 600 Ohms TERM/BRDG — TERM (switch released) EXEC — Press once SET REF — Press once ADV — Press twice

(Procedure continued on next page)

CALIBRATION PROCEDURE
CHART 5-A

Step	Procedure
92	Adjust R69 on A4 until the Level/Count display on the 812A starts counting.
93	Repeat the IMPL NOISE test with the same settings except for Threshold 60 dBrn.
94	Verify that the Level/Count display of 812A does not count.
	NOTE: The display will be counting after the first pressing of the ADV key. When the ADV key is pressed a second time, the display stops counting.
	Common Mode Front End Alignment
95	Turn 812A OFF.
96	Pull the A5A Board out of the card cage.
97	Insert the Extender Board into the A5A slot of the card cage.
98	Insert the A5A Board into the Extender Board.
99	Turn 812A power ON.
100	After the unit completes the self-test, perform a Noise test with 3 kHz Noise filter, No Notch.
101	Plug the 310 phone plug end (of a 310 to double banana and single banana tset cord) to the RCV jack.
102	Short out the banana plugs (not the single banana for ground) using the double banana plug four terminal isolation. Connect ground from the Function Generator to the ground strap of the banana plugs.
103	Set the Function Generator to 60 Hz and maximum gain.
104	Insert the 60 Hz signal to the shorted banana plugs.
105	Adjust R18 on the A5A Board to get the lowest possible number on the display.
106	Remove the 310 phone plug from the RCV jack and change the frequency of the Function Generator to 40 kHz.

(Procedure continued on next page)

CALIBRATION PROCEDURE
CHART 5-A

Step	Procedure
107	Put a jumper between TP3 and R32 on the A5A Board.
108	Using leads from the Function Generator, feed signal between A GND (logic ground) and F GND (folding ground).
109	Set the 812A to 50 kHz.
110	Adjust R37 on the A5A Board to get the lowest number on the display.
111	Turn 812A OFF.
112	Remove the Extender Board.
113	Insert the A5A Board into the card cage.
Noise Floor Test	
114	Turn 812A ON.
115	After the unit completes the self-test, perform a Noise test with the following settings: C-MSG, NO NOTCH, 600 OHMS, TERM/BRDG switch to TERM.
116	Verify that the 812A reads a level not higher than -2 dBrn.
117	Perform four additional Noise tests with the following filters: 3 kHz, PROG, 15 kHz, and 50 kHz. In each case, verify that the 812A reads a level not higher than - 2 dBrn.
118	If there is a high reading, check the 500 kHz filters.

CALIBRATION PROCEDURE IS COMPLETE

SECTION 6.

TECHNICAL DATA

6.1 SPECIFICATIONS

6.1.1 Table 6-1 lists the specifications for the 812A.

Table 6-1. Specifications

TRANSMITTER

Frequency	50 Hz to 85 kHz, selected by keypad: -1004 Hz test tone -SLOPE frequency plan -two VF sweep plans -programmable sweep -discrete frequency
Frequency resolution	1 Hz, <10 kHz 10 Hz, ≥10 kHz
Frequency accuracy	±.01%
Level	-50 dBm to +10 dBm 0 dBm max. < 200 Hz
Flatness	± 0.1 dB @1004 Hz (-19 dBm to 0 dBm) ± 0.2 dB 200 Hz to 15 kHz ± 0.5 dB <200 Hz and >15 kHz
Distortion	-50 dB, 150 Hz to 85 kHz (600Ω/900Ω)
Sweep control	automatic with manual hold
Sweep rate	5 sec. per frequency

LEVEL/FREQUENCY MEASUREMENT

Frequency	50 Hz to 85 kHz
Level	-50 dBm to +10 dBm
Accuracy	± 0.1 dB @1004 Hz (-19 dBm to 0 dBm) ± 0.2 dB 200 Hz to 15 kHz ± 0.5 dB <200 Hz, >15 kHz
Relative level	60 dB range
Frequency resolution	1 Hz, <10 kHz 10 Hz, ≥10 kHz
Level resolution	0.1 dB
Level detector	averaging
Noise protection	low frequency noise rejection filter selected automatically

NOISE MEASUREMENT

Modes	-idle circuit noise -signal to noise, incl. noise with tone -noise to ground
Filter weighting	C-MSG, 3 kHz FLAT, PROGRAM, 15 kHz, 50 Kbit wideband
Range, metallic	10 dBrn to 90 dBrn
Range, to ground	50 dBrn to 130 dBrn
Range, S/N	10 dB to 50 dB
Notch filter	995 to 1025 Hz
Accuracy, metallic	1 dB
Accuracy, to ground	1.5 dB
Resolution	1 dB
Detector	RMS

IMPULSE NOISE MEASUREMENT

Threshold setting	adjustable in 1 dB steps, 30 dBrn to 102 dBrn
2nd level	+4 dB relative to setting
3rd level	+8 dB relative to setting
Filter weighting	same as NOISE, with notch
Count rate	8 pps or 100 pps
Count capacity	9999
Timer	1 min. steps to 9999 min. and continuous

PEAK-TO-AVERAGE RATIO (OPTIONAL)

Output level	-40 dBm to 0 dBm
Range	0 units to 120 units
Accuracy	± 2; 30 units to 110 units ± 4: < 30 units, >110 units
Resolution	1 unit

RETURN LOSS (OPTIONAL)

Output level	-40 dBm to 0 dBm
Modes	2-wire (RL) 4-wire (THL)
Test signals	broad-band noise, filtered as follows:
—ERL	560 Hz to 1965 Hz
—SRL-LO	260 Hz to 500 Hz
—SRL-HI	2200 Hz to 3400 Hz
Range	0 dB to 50 dB
Accuracy	±0.5 dB, 0 dB to -40 dB
Resolution	0.1 dB
Balance network	600Ω/900Ω +2.16 µF 1% tolerance

GENERAL

Impedance	135Ω, 600Ω, and 900Ω
Bridging impedance	50 kΩ, min.
Holding circuits	23 mA min.; 1700 Ω, 46V 40 mA max.; 400 Ω, 53V
Power requirements	115/230 VAC ±10%; 50/60 Hz approximately 30 watts
Battery pack (optional)	NiCad, 14.4V, 4 hr. capacity charges in 14-16 hours.
Dimensions	7" x 13½" x 10½" (nominal)
Weight	22 lbs., incl. batteries

6.2 SWEEP PLANS

6.2.1 The four sweep plans available for LEVEL/FREQUENCY and ATTENUATION DISTORTION tests are listed in Table 6-2 below.

Table 6-2. Sweep Plan Description

SWEEP PLAN	DESCRIPTION
SLOPE	404 Hz, 1004 Hz, and 2804 Hz
SWP A	Standard Sweep, 304 Hz to 3204 Hz as follows: 304, 504, 604, 804, 1004 (Ref.), 1204, 1404, 1604, 1804, 2004, 2204, 2404, 2504, 2704, 2804, 3004, 3204 Hz.
SWP B	204 Hz to 4004 Hz in 100 Hz steps (excluding 2604 Hz).
SWP C	Programmable Sweep: Choose start and stop frequencies, step size, and skip frequency.

6.3 DEFAULT VALUES

6.3.1 Default Parameter Values for each test function are stored in the instrument's nonvolatile memory. Table 6-3 lists these default values for each test function. The test set will display the default parameter value only when the instrument is powered up after being turned off for more than two weeks. Otherwise, a previously selected test parameter will be displayed.

Table 6-3. Default Values

FUNCTION	DEFAULT PARAMETER VALUE	
LEV/FREQ	Level	0.0 dBm
	Frequency	1004 Hz
ATTN DIST	Level	0.0 dBm
	Frequency	1004 Hz
NOISE	Filter	C MSG
S/N	Level	0.0 dBm
	Frequency	1004 Hz
	Filter	C MSG
N/G	Filter	C MSG
IMPL NOISE	Level	0.0 dBm
	Frequency	1004 Hz
	Filter	C MSG
	Count Rate	STANDARD (8 pps)
	Noise Level - Threshold (LOW)	59 dBrn
	- MID/HIGH	+4 dB/+8 dB
	Duration	10 Min
P/AR	Level	0.0 dBm
RL 2W/4W	Level	0.0 dBm
	Filter	ERL

6.4 ERROR CODES FOR 812A

Error numbers are displayed during the calibration and self-test process.

6.4.1 Table 6-4 lists Error Codes for the 812A. Any two-digit message preceded with the letter "P" indicates a fatal set-operation condition; the unit should be removed from service. Consult Section 5 for the appropriate repair procedures.

Table 6-4. Error Codes for the 812A

ERROR	DESCRIPTION
E1	ROM 0 Checksum
E2	ROM 1 "
E3	ROM 2 "
E4	ROM 3 "
E5	ROM 4 "
E6	RAM Failure
E10	RMS detector DC error correction factor too high (>150 counts)
E11	AVE detector DC error correction factor too high (>150 counts)
E12	C Message Filter correction factor @ 0.0 dBm too high (>6 dB)
E13	Notch Filter " " " "
E14	RMS Detector " " " "
E15	Program Filter " " " "
E16	50 Kilobit Filter " " " "
E17	High gain stage " " " "
E18	Transmitter
E20	+10 dBm Fixed gain check bad (Transmitter and/or Receiver bad)
E21	+ 4 dBm " " " " "
E22	- 2 dBm " " " " "
E23	- 8 dBm " " " " "
E24	-14 dBm " " " " "
E25	-20 dBm " " " " "
E26	-26 dBm " " " " "
E27	-32 dBm " " " " "
E28	-38 dBm " " " " "
E29	-44 dBm " " " " "
E30	-50 dBm " " " " "
E40	1004 Hz @ 0.0 dBm Level Bad
E41	1004 Hz @ 0.0 dBm Frequency Bad
E42	50 Hz @ 0.0 dBm Level Bad
E43	50 Hz @ 0.0 dBm Frequency Bad
E44	85 kHz @ 0.0 dBm Level Bad
E45	85 kHz @ 0.0 dBm Frequency Bad
E50	P/AR Option Not Present
E51	P/AR Transmit Error
E52	P/AR Peak Detector Error
E53	P/AR Average Detector Error
E60	Return Loss Option Not Present
E61	Return Loss SRL (Low) Transmit Error
E62	Return Loss SRL-HI " "
E63	Return Loss ERL " "
E64	Improper termination for Return Loss Tests
PXX	Fatal ROM condition; remove unit from service

6.5 READOUT FOR THE SELECTED FUNCTIONS

Once a test function has been selected, and all procedures for that test have been completed, the LCD display will provide the information detailed in Table 6-5.

Table 6-5. Test Function Readouts

FUNCTION	LEFT DISPLAY FREQ/TIME	RIGHT DISPLAY LEVEL/COUNTS
Level/Frequency	NNNN Hz or NN.NN kHz	-NN.N dBm
Attenuation Distortion		
at reference frequency	1004 Hz	-NN.N dBm
at other frequency	NNNN Hz or NN.NN kHz	-NN.N dB
NOISE without tone	———	-NN dBrn
with tone	1004 Hz	-NN dBrn
Signal to Noise Ratio		
Signal to Noise Ratio expressed in dB Display can be stepped using the ADV Key	———	-NN dB
1. Notched Noise	———	-NN dBrn
2. Frequency and Level	1004 Hz	-NN.N dBm
Noise to Ground	———	-NN dBrn
Impulse Noise		
Various steps within a function		
1. When the transmit level is set	———	-NN.N dBm
2. When the Noise threshold is set	———	NN dBrn
3. When the count rate is selected	———	———
4. When the count duration is set	NNNN min.	———
5. Number of threshold counts (Level 1)	———	NNNN
6. Number of mid level counts (Level 2)	———	NNNN
7. Number of high level counts (Level 3)	———	NNNN
P/AR Function	———	NNN Units
Return Loss Function		
2 Wire / 4 Wire	———	-NN.N dB

SECTION 7

PARTS LIST

7.1 GENERAL

7.1.1 Section 7 includes parts lists for each subassembly of the 812A test set. The information applies to the instruments as produced in Sierra's factory at the date of this manual.

If this manual is being used for maintenance and repair on an instrument made at another time, the user must recognize that differences may exist between the manual information and the hardware.

Test set improvements have been made on a continuing basis since the instrument was first introduced. Generally, the information contained in this manual applies to all 812A test sets.

When specific information does not appear to apply to the instrument under test, the user should call the Customer Service Department at the factory, giving the model number, serial number and date of purchase. The Sierra representative will provide the needed instructions and information to augment the material given in this section.

The parts lists are arranged in the following order:

A1	Central Processing Unit (CPU), Computer and Clock Generator
A2-1	Memory Expansion
A4	Converter
A5A	Filter Gain
A5B	Filter Gain
A8	Transmitter
A11	Power Supply
A12	Display Driver
A13	Line Interface A
A14	Line Interface B
A16	Backplane
A17	Holding Circuit
	Front Panel
	Final Assembly

NOTE: For those who do their own maintenance and repair, it may be desirable to stock a set of spares so that out-of-service time can be kept to a minimum. Factory service records indicate that the Recommemded Spare Parts in Table 7-1 will meet most emergencies.

TABLE 7-1
RECOMMENDED SPARE PARTS

SIERRA PART NO.	DESCRIPTION	QUANTITY
910504650	L.E.D.	5
911300080	Pushbutton Switch	1
911300081	Pushbutton Switch	1
913200058	Fuse, 2A Normal Blow (Battery)	1
913200061	Fuse, 0.4A Normal Blow (A. C. Input)	1
915600007	Feet, Rubber	2
918100046	Handle Side Bar Kit	1
918100047	Bar, Handle	1
919900105	Power Supply	1
920203880	I.C., MK 3882N (Counter Timer Circuit CTC)	1
920203882	I.C., MK 3880N (Central Processor Unit CPU)	1
920204046	I.C., CD 4046 (Phase Lock Loop)	1
920205101	I.C., 5101L CMOS RAM (256 x 4)	1
920207550	I.C., AD 7550 (A to D Converter)	1
920300536	I.C., AD 536J (RMS Detector)	1
920310318	I.C., LM 318N (Average Detector)	1
920342501	I.C., Programmed Bipolar PROM	1
922000017	Adapter, Handle Mounting	1
922100001	L.C.D. Display	1

QTY	ITEM	PART NO.	DESCRIPTION	REF.
1	35	901900150	15 PF DM	C-28
2	34	910303906	TRANSISTOR 2N3906	Q1, Q2
2	33	901910270	CAP 27Pf 20% DIPPED MICA	C8, C22
	32			
1	31	901340103	CAP .01 µF 10% 50V MINI CERAMIC	C7
20	30	901300104	CAP .1 µF 20% 50V MINI CERAMIC	C2, C4-C6
	30		C9-C19	C23-C27
2	29	902710106	CAP 10 µF 20% 20V TANTALUM	C1, 3
1	28	901930102	CAP 1000 Pf 2% DM	C20
1	27	910504148	DIODE, IN4148	CR1
1	26	910303904	TRANSISTOR 2N3904	Q3
2	25	920205101	I.C. 5101 256×4 CMOS RAM	U8, U9
	24			
4	23	920374245	74LS245 OCTAL TRANCEIVERS	U29-U32
1	22	920203880	MK3880N CPU	U28
1	21	920203882	MK 3882 N CTC	U27
4	20	920240160	40160 (CMOS	U24-26,33
1	19	920207474	74C74 DUAL D FLIP FLOP	U23
	18			
1	17	920204052	4052 DUAL 1 OF 4 MUX	U16
1	16	920327410	74LS10	U15
1	15	920342501	PROM (A03411600)	U14
1	14	920307432	74LS32	U12
	13			
1	12	920204013	4013 DUAL D FLIP FLOP	U7
	11			
1	10	920374368	74LS368 HEX INVERT TRI-STATE	U5
1	9	920327404	74LS04 HEX INVERTERS	U4
2	8	920374139	74LS139 DUAL 2-4 DECODERS	U3, U13
1	7	920317420	74LS20 DUAL INPUT NAND	U2
1	6	920374260	74LS260 DUAL 5 INPUT NAND	U1
2	5	920202114	2114L 1K×4 NMOS RAM	U17, U18
1	4	920374160	I.C. 74LS160	U34
	3			
1	2	904500734	A1-2 CPU PWB (C03357300)	
REF	1	D03389802	A1-2 CPU PWB ASSY	

	72			
	71			
2"	70	8150-0042	26 AWG SOLID GREEN WIRE	
	69			
1	68	4324010 13	INSULATION .750 LE	
1	67	918500025	BATTERY 2.4V P.C. MOUNT	BAT 1
2	66	914200105	18 PIN SOCKET	XU10, XU11
1	65	914200084	16-PIN SOCKET	XU 14
1	64	914200092	SOCKET, 40 PIN DIP PC MOUNT GOLD	XU 28
2	63	914200107	SOCKET, 22 PIN	XU8-XU9
4	62	914200103	SOCKET, 24 PIN	XU19-22
1	61	914200102	SOCKET, 28 PIN	XU27
	60			
1	59	911000110	DIP SWITCH, 8 POSITION	S1
1	58	911300077	SWITCH, SPDT MOMENTARY	S3
	57			
1	56	914800325	MINIMAX CONNECTOR	J1
	55			
2	54	920400022	PCB CARD EJECTOR	
1	53	906900222	RES. 2.2K, 1/4 W, 5%	R15
1	52	906900223	RES. 22K, 1/4W. 5%	R10
1	51	912200235	CRSYSTAL, 2.00 MHZ	Y1
1	50	920816473	RES. NET 47K 8 RES DIP	RP1
1	49	906900122	RES., 1.2K, 5%, 1/4W	R30
1	48	906900331	RES. 330 Ω, 1/4W, 5%	R13,
8	47	906900103	RES. 10K 1/4W, 5%	R1-R3, 5, 11, 14, 26, 29
1	46	906900220	RESISTOR 22, 5% 1/4W	R24
2	45	907302211	RESISTOR 2.21K, 1%, 1/8W	R6, R7
1	44	A03414503	PROGRAMMED EPROM	U22
1	43	906900221	RESISTOR 220, 5% 1/4W	R23
5	42	906900472	RESISTOR 4.7K, 5%, 1/4W	R12, 16, 18, 19, 27
1	41	A03414502	PROGRAMMED EPROM	U21
1	40	A03414501	PROGRAMMED EPROM	U20
2	39	906900102	RESISTOR, 1K, 5%, 1/4W	R8, 20
2	37	906900104	RESISTOR, 100K, 5%, 1/4W	R9, R25
1	36	A03414500	PROGRAMMED EPROM	U19
	36			
QTY	ITEM	PART NO.	DESCRIPTION	REF.

	37			
	36			
	35			
	34			
	33			
	32			
	31			
	30			
	29			
	28			
	27			
	26			
	25			
	24			
	23			
	22			
	21			
1	20	914200103	SOCKET 24 PIN	XU5
2	19	920400022	CARD EJECTOR	
1	18	914800325	MINI MAX CONNECTOR 100 PIN	J1
	17			
1	16	920274373	I.C. 74C373	U8
1	15	920327400	I.C. 74LS00	U7
1	14	920317474	I.C. 74LS74	U6
	13			
1	12	920374138	I.C. 74LS138 1-TO-8 DECODER	U1
1	11	A03414504	PROGRAMMED EPROM	U5
	10			
6	9	901300104	CAPACITOR, CERAMIC 0.1μF, 50V.	C1 – C6.
	8			
	7			
	6			
	5			
	4			
	3			
1	2	904500731	A2 P.W.B. (C03373000)	
REF.	1	D03436800	A2-1 P.W.B. ASSY.	
QTY	ITEM	PART NO.	DESCRIPTION	REF.

QTY	ITEM	PART NO.	DESCRIPTION	REF.
2	37	906900472	RESISTOR 4.7K, 5%, 1/4W	R21,70
3	36	906900102	1K, 5%, 1/4 W	R19,45,61
1	35	906900513	51K, 5%, 1/4W	R18
2	34	906900272	2.7K, 5%, 1/4 W	R16,R20
1	33	907309092	90.9K, 1%, 1/8 W	R15
2	32	907304991	4.99K, 1%, 1/8W	R10,12
2	31	906900101	100Ω, 5%, 1/4W	R7, 8
2	30	907301002	10K, 1%, 1/8W	R5, R57
4	29	907302002	20K, 1%, 1/8W	R2,3,4,6
3	28	906900105	RESISTOR 1M, 5%, 1/4W	R9,67,68
1	27	907308061	RESISTOR 8.06K, 1/8W, 1%	R14
1	26	920204046	I.C. CD4046	U3
1	25	920305043	HI-5043	U2
2	24	920300311	LM 311N	U1, U4
1	23	920327404	74LS04	U33
1	22	920327410	74LS10N	U32
1	21	920317427	74LS27	U31
1	20	920374154	74LS154	U30
1	19	920374245	74LS245	U29
2	18	920274374	74C374	U24,25
1	17	920207550	AD 7550	U23
1	16	920300339	LM 339	U22
2	15	920204051	CD 4051	U20,U21
1	14	920300386	LM 386	U19
1	13	920320002	REF 02 CJ	U18
1	12	920200508	HI-508A	U17
1	11	920300536	AD536J	U16
1	10	920207490	74C90	U11
2	9	920210082	TL082	U10,U15
1	8	920310318	LM318N	U9
1	7	920210084	TL084	U8
3	6	920274373	74C373	U7,14,28
2	5	920204520	MC 14520	U6,U13
4	4	920204013	I.C. CD 4013	U5,26,27,34
	3			
1	2	904500763	A4 PWB (CO 3403200)	
REF	1	DO3403500	A4, PWB ASSY	

QTY	ITEM	PART NO.	DESCRIPTION	REF.
8	72	901300474	CAP. 0.47 UF, 50V, 20%, CER.	C1, 2, 17,
				21, 26, 27, 61, 63
	71			
1	70	907307502	RESISTOR 75K, 1%, 1/8W	R66
1	69	907930203	POT. 20K, 10%	R69
1	68	907900229	POT. 10K, 1 TURN	R11
1	67	907301822	RESISTOR 18.2K, 1%, 1/8W	R17
2	66	920660103	RESISTOR PACK, 10K x 5	RN1, RN2
1	65	906900134	RESISTOR 130K, 5%, 1/4W	R65
2	64	906900100	10Ω, 5%, 1/4W	R63, 64
1	63	906900392	3.9K, 5%, 1/4W	R62
1	62	907302001	2K, 1%, 1/8W	R59
1	61	906900103	10K, 5%, 1/4W	R58
1	60	907302551	2.55K, 1%, 1/8W	R48
1	59	907307321	7.32K, 1%, 1/8W	R47
1	58	907301182	11.8K, 1%, 1/8W	R46
1	57	907301132	11.3K, 1%, 1/8W	R44
1	56	907301371	1.37K, 1%, 1/8W	R43
1	55	907301501	1.50K, 1%, 1/8W	R42
1	54	907301741	1.74K, 1%, 1/8W	R41
1	53	907301961	1.96K, 1%, 1/8W	R40
1	52	907302151	2.15K, 1%, 1/8W	R39
1	51	907303922	39.2K, 1%, 1/8W MF	R38
1	50	907302492	24.9K, 1%, 1/8W	R37
3	49	907304992	49.9K, 1%, 1/8W	R34-36
1	48	906902R70	2.7Ω, 5%, 1/4W	R33
8	47	906900104	100K, 5%, 1/4W	R1, 13, 31,
				R49, 50, 51, 54, 60
1	46	906900205	2M, 5%, 1/4W	R30
1	45	906900270	27Ω, 5%, 1/4W	R29
1	44	906900470	47Ω, 5%, 1/4W	R28
1	43	906900750	75Ω, 5%, 1/4W	R27
1	42	906900121	120Ω, 5%, 1/4W	R26
1	41	906900181	180Ω, 5%, 1/4W	R25
1	40	906900301	300Ω, 5%, 1/4W	R24
1	39	906900471	470Ω, 5%, 1/4W	R23
1	38	906900751	RESISTOR, 750Ω, 5%, 1/4W	R22

QTY	ITEM	PART NO.	DESCRIPTION	REF.
1	96	914200092	40 PIN DIP SOCKET	XU23
1	95	914800325	CONNECTOR, MINIMAX, 100 PINS	J1
2	94	920400022	PCB CARD EJECTOR	
	93			
	92			
1	91	910303904	TRANSISTOR 2N3904	Q1
2	90	910500695	IN695 GERMANIUM DIODE	CR6, 8
6	89	910504148	DIODE IN4148	CR1-5, 7
	88			
	87			
	86			
1	85	901330103	0.01 UF CER.	C62
1	84	901900221	220 PF DM, 5%	C60
1	83	901900820	82 PF DM, 2%	C59
2	82	902740226	22 UF TANT	C35,37
1	81	901900560	56 PF DM	C28
1	80	902220257	250 UF TANT	C23
3	79	903310106	10 UF NP	C19,56,57
1	78	901900181	180 PF DM 5%	C18
1	77	901100392	0.0039 UF MYLAR	C13
4	76	902710106	10 UF, TANT	C7,10,11,31
1	75	902740105	1.0 UF, 35 VDC, TANT	C6
1	74	902710225	2.2 UF, TANT	C5
28	73	901300104	CAP. 0.1 UF, 50V, 20% CER.	C3,4,8.
			C9,12,14,15,16,24,25,30,32,33,34,	
			C39,41,43,48.49,50,51,52,53,64,65,66,67,68.	

QTY	ITEM	PART NO.	DESCRIPTION	REF.
4	37	902220106	CAPACITOR, 10μf	C34,C35,C38,C52
2	36	901900680	68 PF 2%, 500V. D.M.	C68,C69
1	35	901900681	680 PF, 5%, 300V D.M.	C77
	34			
	33			
	32			
4	31	909000156	INDUCTOR, 330μH	L1,L2,L3,L5
1	30	909000129	INDUCTOR, 33μH	L4
	29			
1	28	909900050	TRANSFORMER, BUG 6-09	T1
2	27	909910013	TRANSFORMER, PT3099	T2,T3
	26			
	25			
25	24	910504148	DIODE, IN4148	CR1-CR25
	23			
	22			
	21			
1	20	910303904	TRANSISTOR, 2N3904	Q1
3	19	910303906	TRANSISTOR, 2N3906	Q2,Q3,Q4
	18			
	17			
	16			
	15			
1	14	920200830	I.C., DAC0830	U15
1	13	920204013	,CD4013	U11
6	12	920210084	,TL084	U6,U8,U9,U10,U14,U16
	11			
1	10	920300428	,4N28	U5
4	9	920205043	,HI5043	U3,U7,U12,U13
	8			
3	7	920300353	I.C., LF353	U1,U2,U4
	6			
	5			
	4			
	3			
1	2	904500761	A5A PWB (C03402000)	
REF	1	C03402100	A5A, PWB ASSY	

QTY	ITEM	PART NO.	DESCRIPTION	REF.
8	74	906900105	RESISTOR, 1M, 1/4W, 5%	R25, R26,
	73		R29, R68, R69, R70, R75, R76	
2	72	907306191	6.19K, 1/8W, 1%	R22, R23
2	71	907304992	49.9K, 1/8W, 1%	R20, R21
2	70	907308450	845Ω, 1/8W, 1%	R19, R24
2	69	907309091	9.09K, 1/8W, 1%	R17, R36
5	68	907305111	5.11K, 1/8W, 1%	R13, R14
	67		R30	R31, R83
4	66	907304751	4.75K, 1/8W, 1%	R49, R50
	65			R55, R56
2	64	907308060	806Ω, 1/8W, 1%	R10, R82
2	63	907301501	1.5K, 1/8W, 1%	R8, R11
2	62	906900106	10M, 1/4W, 5%	R6, R7
10	61	907301002	10K, 1/8W, 1%	R4, R5, R16
	60		R33, R34, R35, R78, R79,	R80, R81
2	59	907302003	200K, 1/8W, 1%	R2, R3
2	58	907301001	1K, 1/8W, 1%	R1, R9
1	57	907302002	20K, 1/8W, 1%	R12
2	56	907304991	RESISTOR, 4.99K, 1/8W, 1%	R44, R86
2	55	902740226	CAPACITOR, 22 μf TANT.	C54, C56
1	54	901320103	.01 μf, CER (CK05)	C70
2	53	901900101	100 pf, 5%	C75, C76
1	52	901920471	470 pf 2%	C21
2	51	901900301	300 pf, 5%	C22, C73
2	50	901900080	8 pf, 5%	C23, C72
8	49	901120103	0.01 μf, 1%, POLYPROP	C16, C17
	48		C18, C19, C25, C29,	C31, C24
12	47	901300474	.47 μf, 50V, 20%	C9, C11, C12
	46		C74, C15, C37, C40, C41, C42,	C45, C46, C47
2	45	901900100	10 pf, 5% DIP MICA	C43, C44
7	44	901930102	1000 pf, 2%, DM 15	C8, C10
	43		C71, C20, C28,	C30, C32
27	42	901300104	0.1 μf 50V	C5, C6, C7
	41		C48, C13, C14, C26, C27, C33	C36, C39
	40		C50, C51, C55, C53, C49,	C57-C67
2	39	901340104	0.1 μf, 200V, 10%	C2, C3
2	38	901310474	CAPACITOR, 0.47 μf, 500V, 20%	C1, C4

	111			
	110			
	109			
2	108	920400022	PWB CARD EJECTOR	
3	107	907900331	POTENTIOMETER, 20K	R54,R60,
	106			R48
2	105	907900288	POTENTIOMETER, 2K	R18,R37
1	104	914800325	CONNECTOR, MINIMAX	J1
2	103	912600095	RELAY, DPDT	K1, K,2
1	102	907301502	RESISTOR, 15K, 1/8 W, 1%	R87
1	101	906900104	100K, 1/4W, 5%	R88
1	100	907301372	13.7 K, 1/8W, 1%	R74
1	99	907303011	3.01 K, 1/8 W, 1%	R73
1	98	907711372	13.7 K, 1/8W, 0.1%	R72
1	97	907704420	442Ω, 1/8W, 0.1%	R71
1	96	906900100	10Ω, 1/4 W, 5%	R67
1	95	906900221	220Ω, 1/4W, 5%	R66
2	94	906900112	1.1K, 1/4W, 5%	R61, R63
2	93	906900103	10K, 1/4W, 5%	R64,R65
	92			
1	91	907301333	133K, 1/8W, 1%	R59
1	90	907302262	22.6K, 1/8W, 1%	R58
1	89	907301822	18.2K, 1/8W, 1%	R57
1	88	907301003	100K, 1/8W, 1%	R53
1	87	907301782	17.8 K, 1/8 W, 1%	R52
1	86	907302212	22.1 K, 1/8W, 1%	R51
1	85	907305362	53.6 K, 1/8W, 1%	R47
2	84	907301582	15.8 K, 1/8 W, 1%	R45,R46
1	83	907302742	27.4K, 1/8W, 1%	R38
1	82	907301873	187 K, 1/8W, 1%	R39
1	81	907307872	78.7K, 1/8W, 1%	R40
1	80	907306652	66.5K, 1/8W, 1%	R41
1	79	907301962	19.6K, 1/8W, 1%	R42
1	78	907301212	12.1K, 1/8W, 1%	R43
1	77	907341R20	41.2Ω, 1/8W, 1%	R32
2	76	906900565	5.6 M, 1/4W, 5%	R28, R77
1	75	906900272	RESISTOR, 2.7 K, 1/4 W, 5%	R27
QTY	ITEM	PART NO.	DESCRIPTION	REF.

QTY	ITEM	PART NO.	DESCRIPTION	REF.
1	36	907307501	RESISTOR 7.5K, 1/8W, 1%	R27
	35			
1	34	907302742	27.4K, 1/8W, 1%	R23
1	33	907301742	17.4K, 1/8W, 1%	R22
2	32	907302492	24.9K, 1/8W, 1%	R20,R21
1	31	907306652	66.5K, 1/8W, 1%	R19
1	30	907303922	39.2K, 1/8W, 1%	R18
1	29	907304122	41.2K, 1/8W, 1%	R17
1	28	907309531	9.53K, 1/8W, 1%	R13
1	27	907306192	61.9K, 1/8W, 1%	R12
1	26	907303832	38.3K, 1/8W, 1%	R11
1	25	907301073	107K, 1/8W, 1%	R10
2	24	907302432	24.3K, 1/8W, 1%	R9,R15
1	23	907306812	68.1K, 1/8W, 1%	R8
1	22	907304121	4.12K, 1/8W, 1%	R7
1	21	907307322	73.2K, 1/8W, 1%	R6
1	20	907307681	7.68K, 1/8W, 1%	R5
10	19	907301002	RESISTOR 10K, 1/8W, 1%	R1,2,3,4,
	19		14,16, 60,61,67,68	
1	18	907301001	RESISTOR 1.00K, 1/8W, 1%	R71
1	17	9090000156	INDUCTOR 330UH, 5%	L1
7	16	910504148	DIODE IN 4148	CR1-CR7
	15			
	14			
1	13	910304401	TRANSISTOR 2N 4401	Q1
	12			
	11			
4	10	920210082	I.C. TL082	U10,11,13,14
2	9	920205043	HI 5043	U9,U15
2	8	920274374	74C374	U7,U8
2	7	920200508	HI508A	U6,U12
5	6	920210084	I.C. TL084	U1-U5
	5			
1	4	914800325	CONNECTOR MINI MAX	J1
2	3	920400022	PWB CARD EJECTOR(A02604100)	
1	2	904500762	PWB A5B (C03402500)	
REF	1	C03402600	PWB ASSY., A5B	

QTY	ITEM	PART NO.	DESCRIPTION	REF.
10	71	901120103	CAPACITOR .01 UF, 1%	C1,2,13,
	71		14,15,16,18,21,73,74	
	70			
	69			
	68			
	67			
1	66	907900316	POTENTIOMETER 5K	R66
1	65	907900315	POTENTIOMETER 500Ω	R57
1	64	906900514	RESISTOR 510K, ¼W, 5%	R54
1	63	906900104	100K, ¼W, 5%	R46
1	62	907301503	150K, 1/8W, 1%	R69
1	61	907301272	12.7K, 1/8W, 1%	R65
2	60	907301502	15K, 1/8W, 1% MF	R64,R70
2	59	906900752	7.5K, ¼W, 5% CC	R62,R63
1	58	906900221	220Ω, 1/8W, 1%	R59
1	57	907308060	806Ω, 1/8W, 1%	R58
1	56	907307150	715Ω, 1/8W, 1%	R56
2	55	907304531	4.53K, 1/8W, 1%	R26,R52
2	54	907711000	100Ω 1/8W, 0.1%	R50,R51
1	53	907712000	200Ω 1/8W, 0.1%	R49
1	52	907714000	400Ω, 1/8W, 0.1%	R48
1	51	907718000	800Ω, 1/8W, 0.1%	R47
1	50	907704420	442Ω, 1/8W, 0.1%	R44
1	49	907711372	13.7K, 1/8W, 0.1%	R43
3	48	907301372	13.7K, 1/8W, 1%	R42,53,55
1	47	907303011	3.01K, 1/8W, 1%	R41
3	46	906900105	1M, 1/4W, 5%	R39,40,
	46			45
1	45	907301003	100K, 1/8W, 1%	R38
1	44	907306042	60.4K, 1/8W, 1%	R37
1	43	907306041	6.04K, 1/8W, 1%	R36
2	42	907302871	2.87K, 1/8W, 1%	R34,R35
2	41	907304751	4.75K, 1/8W, 1%	R32,R33
1	40	907301402	14 K, 1/8W, 1%	R31
1	39	907308871	8.87K, 1/8W, 1%	R30
1	38	907303092	30.9K, 1/8W, 1%	R29
1	37	907301911	RESISTOR 1.91K, 1/8W, 1%	R28

	104			
	103			
	102			
	101			
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1	86	901900080	CAPACITOR, 8 PF, 2%	C56
1	85	901910301	300PF, 2%	C55
2	84	902740226	22UF, 20%	C48,51
1	83	902220106	10UF, -10 +50%	C46
4	82	901900100	10PF, 5%	C38,40,44,45
4	81	901300474	.47UF, 20%	C35,36,
	81			41,42
3	80	901920471	470PF, 2%	C24,32,34
1	79	901910101	100PF, 2%	C28
1	78	902070181	180PF, 2%	C26
1	77	901330821	820 PF, 1%, NPO	C22
1	76	901330331	330PF, 1%, NPO	C20
1	75	901910151	150PF, 2%	C7
31	74	901300104	.1UF, 50V, CER.	C6,8,17,
			C19, 29, 30, 37, 39, 47, 49, 50,	
			43,53,54,58-68,69,70,71,72,75,76,	
2	73	901910221	220PF, 2% DM	C4,C10
11	72	901930102	CAPACITOR, 1000PF, 2%	C3,5,9,
	72		11,12,23, 25,27,31,33,57	
QTY	ITEM	PART NO.	DESCRIPTION	REF.

QTY	ITEM	PART NO.	DESCRIPTION	REF.
	37			
	36			
	35			
1	34	910304403	TRANSISTOR 2N4403	Q4
1	33	910303904	2N3904	Q3,
	32			
3	31	910303906	TRANSISTOR 2N3906	Q1,2,5
	30			
	29			
	28			
5	27	920374283	I.C. 74LS283N	U16,U17
	26		U23	U24,U25
6	25	920274374	MM74C374	U8,U9
	24		U29,U30,	U31,U32
	23			
2	22	920374174	74LS174	U11,U18
1	21	920327404	74LS04	U19
	20			
1	19	920310008	DAC-08	U6
1	18	920320002	REF-02	U4
1	17	920310318	LM318N	U5
1	16	920374260	74LS260	U33
1	15	914200103	24 PIN DIP SOC REF U10	XU10
1	14	920374138	74LS138	U26
2	13	920207474	74C74	U7,U28
5	12	920210082	TL082N	U3,U12
	11		U13	U14,U27
1	10	920204027	MC14027BCP	U1
1	9	920207531	AD7531KN	U21
2	8	920204051	MC14051	U20,U22
1	7	920204053	I.C. MC14053	U15
1	6	A03456000	PROGRAMMED EPROM	U-10
	5			
	4			
	3			
1	2	904500733	A8 PWB C03369700	
REF	1	D03396500	A8, PWB ASSY	

QTY	ITEM	PART NO.	DESCRIPTION	REF.
1	74	901340103	CAP. 0.01UF, 10%, CERAMIC	C33
1	73	901900330	CAPACITOR, 33PF D.M.	C32
1	72	901900391	CAPACITOR 390PF, 5%	C18
1	71	902220106	10 uf, 25V,	C10
12	70	901300104	0.1 uf, 50V, 20%	C11, C12, C35
	69		C13, C14, C15, C16, C17, C20, C21,	C22, C34
6	68	901300474	.47 uf, 50V, 20%	C6, C7
	67		C23, C24,	C25, C26
2	66	901900680	.68 PF, 5%	C2, C3
4	65	902220107	100 uf	C4, C5
	64			C8, C9
1	63	901900390	CAPACITOR 39 PF	C19
1	62	901900681	CAPACITOR 680 PF, 5%, 300V DM	C37
	61			
2	60	906900472	RESISTOR, 4.7K, 1/4W, 5%	R35, R39
3	59	906900102	RESISTOR 1K, 1/4W, 5%	R17, R13,
	58			R27
	57			
1	56	906900511	510Ω, 1/4W, 5%	R18
2	55	907301541	1.54K, 1/8W, 1%	R37, R38
2	54	907302002	20K, 1/8W, 1%	R8, R10
1	53	907303480	348Ω, 1/8W, 1%	R30
1	52	907304750	475Ω, 1/8W, 1%	R28
3	51	907304991	4.99K, 1/8W, 1%	R7, R9
	50			R23
7	49	906900100	10Ω, 1/4W, 5%	R1, R25
	48		R26, R32, R33	R34, R36
4	47	906900103	10K, 1/4W, 5% R6	R15, R16, R19
	46			
1	45	906900242	2.4K, 1/4W, 5%	R22
5	44	907301001	1.00K, 1/8W, 1%	R4, R5
	43		R24,	R29, R31
1	42	907302491	2.49K, 1/8W, 1%	R21
1	41	907303092	RESISTOR, 30.9K, 1/8W, 1%	R3
	40			
6	39	910504148	DIODE IN4148	CR1, CR2
	38		CR3, CR4,	CR5, CR6

QTY	ITEM	PART NO.	DESCRIPTION	REF.
2	104	907711000	RESISTOR 100Ω 1/8W .1%	R44,R45
1	103	907712000	RESISTOR 200Ω 1/8W .1%	R43
1	102	907714000	RESISTOR 400Ω 1/8W .1%	R42
1	101	907718000	RESISTOR 800Ω 1/8W .1%	R41
	100			
1	99	B03425600	μ-METAL STRIP	
	98			
2	97	906900112	RESISTOR 1.1K, 1/4W, 5%	R11, 14
1	96	906900104	RESISTOR 100K, 1/4W, 5%	R40
	95			
1	94	912200213	CRYSTAL, 1.048576MHZ (A03280200)	Y1
1	93	914800325	CONNECTOR 100 POS.	
	92			
2	91	920400022	PCB CARD EJECTOR	
	90			
	89			
	88			
	87			
1	86	907900229	POTENTIOMETER 10K	R20
1	85	907900308	POTENTIOMETER 200Ω	R2
	84			
	83			
1	82	909910013	TRANSFORMER PE61051	T2
1	81	909900057	TRANSFORMER BUG6-9	T1
	80			
	79			
1	78	901910270	CAPACITOR 27 PF	C27
3	77	901900330	CAPACITOR 33 PF, 2%	C29,31,32
2	76	901900361	CAPACITOR, 360 PF 1%	C28,C30
	75			

	37			
	36			
	35			
	34			
	33			
1	32	907920501	POTENTIOMETER, 500Ω, 10%	R32
2	31	907920502	POTENTIOMETER, 5k, 10%	R6, R13
	30			
	29			
1	28	905400102	RESISTOR, 1K, 1W, 5%	R35
1	27	906900330	33Ω, ¼W, 5%	R34
1	26	906900100	10Ω, ¼W, 5%	R33
1	25	907302211	2.21K, ⅛W, 1%	R27
1	24	907301182	11.8K, ⅛W, 1%	R26
3	23	906900302	3.0K, ¼W, 5%	R23, R30, R37
1	22	907302801	2.80K, ⅛W, 1%	R22
1	21	907303011	3.01K, ⅛W, 1%	R21
2	20	906900105	1M, ¼W, 5%	R19, R25
1	19	907304321	4.32K, ⅛W, 1%	R13
1	18	907304022	40.2K, ⅛W, 1%	R17
1	17	906900202	2K, ¼W, 5%	R15
1	16	907304532	45.3K, ⅛W, 1%	R14
2	15	906900103	10K, ¼W, 5%	R11, R20
2	14	906900301	300Ω, ¼W, 5%	R10, R12
1	13	906202R74	2.74Ω, 3W, 1% (WIREWOUND)	R9
3	12	907301002	10K, ⅛W, 1%	R7, R8, R16
	12			R24
1	10	907305901	5.9K, ⅛W, 1%	R5
2	9	906900101	100Ω, ¼W, 5%	R4, R28
3	8	906900102	1K, ¼W, 5%	R2, R3, R29
2	7	906900512	5.1K, ¼W, 5%	R1, R31
1	6	906900104	RESISTOR, 100K, ½W, 5%	R36
	5			
	4			
REF	3	A03398600	SPEC., TRANSFORMER DC-DC	
1	2	904500814	A11 P.W.B. (C03498600)	
REF	1	D03498700	A11 P.W.B. ASSY.	
QTY	ITEM	PART NO.	DESCRIPTION	REF.

According to Engineering Change Order # 19384, make the following changes to the parts list for the A11 Board:

Delete:	Qty.:	1
	Item:	61
	Part #:	902280108
	Description:	Capacitor 100 uF, 35V
	Ref:	C17
Add:	Qty.:	1
	Item:	38
	Part #:	813500005
	Description:	24 AWG Green, 7 in
	Ref:	N/A
Add:	Qty.:	1
	Item:	39
	Part #:	913700008
	Description:	Thermal switch 75°C
	Ref:	TS1

QTY	ITEM	PART NO.	DESCRIPTION	REF.
	74			
	73			
	72			
	71			
1	70	920301403	I.C. MC1403	U6
1	69	920300339	LM 339	U5
1	68	920300358	LM 358	U3
1	67	920300320	LM 320-5T	U2
1	66	920320340	I.C. LM 340-5T	U1
	65			
	64			
	63			
1	62	902710106	CAPACITOR, 10μF, 20V	C21
1	61	902260107	100μF, 35V.	C17
1	60	902280108	1000μF, 35V.	C16
4	59	901300104	.1μF, 50V, 20%	C14, C15, C22, C24
1	58	902200477	470μF, 12V, 10%	C9
4	57	902220106	10μF, 25V.	C5, C6, C12,
	57			C13.
3	55	902220157	150μF, 16V	C4, C7, C8.
2	54	901300273	27000pF	C2, C3
7	53	901300474	CAPACITOR, .47μF, 50V, 2%	C1, C10, C11,
	53			C18, C19, C20.
	53			C23.
	50			
1	49	910635241	DIODE IN5241B ZENER, 11V, 5%	CR13
1	48	910630752	IN752A, ZENER, 5.6V, 5%	CR12
4	47	910504148	IN4148	CR10, CR11, CR14, CR15
3	46	910300021	IN4998	CR6, CR7.
	46			CR8.
4	44	910305819	IN5819	CR2, CR3,
	44			CR4, CR5
2	42	910504001	DIODE, IN4001	CR1, CR9
	41			
	40			
	39			
	38			

	111			
	110			
	109			
	108			
2	107	816504012	FLAT WASHER #4	
4	106	816501025	FLAT WASHER #6	
2	105	800004085	SCREW, B.H. 4-40 x 5/16	
2	104	807504007	NUT. HEX 4-40	
4	103	800004163	SCREW, B.H. 6-32 x 7/16	
4	102	808001011	NUT, HEX 6-32	
4	101	819204021	WASHER, #6 SPLIT LOCK	
2	100	819204019	WASHER, #4 SPLIT LOCK	
2	99	917300501	SHOULDER WASHER (FOR U1, U2)	
2	98	915100169	INSULATING WASHER (FOR U1, U2)	
2	97	915100196	INSULATING WASHER (FOR Q1, Q2)	
1	96	914800194	CONNECTOR, 5 PIN, WAFER	J3
1	95	914800242	2 PIN, WAFER	J2
1	94	914800203	CONNECTOR, 8 POS., WAFER	J4
2	93	921300015	HEAT SINK	REF. U1, U2.
2	92	C03387700	HEAT SINK	REF. Q1, Q2
	91			
1	90	910000153	TRANSFORMER, DC-DC	T2
1	89	910000118	TRANSFORMER, SAT. CORE	T1
	88			
	87			
	86			
3	85	909000202	INDUCTOR, 2μH	L2, L3, L4
1	84	909000158	INDUCTOR, WIDE BAND CHOKE	L1
	83			
	82			
	81			
1	80	910404183	SCR, 2N4183	Q6
2	79	910303906	TRANSISTOR, 2N3906	Q4, Q5.
1	78	910306516	2N6516	Q3
2	77	910305427	TRANSISTOR, 2N5427	Q1, Q2
	76			
	75			
QTY	ITEM	PART NO.	DESCRIPTION	REF.

	37			
	36			
	35			
1	34	906900103	RESISTOR, 10K, 1/4W, 5%	R13
8	33	906900180	RESISTOR, 18Ω, 1/4W, 5%	R5-R12
8	32	906900331	RESISTOR, 330Ω, 1/4W, 5%	R1-R4
	31			R14-R17
	30			
4	29	910304401	TRANSISTOR, 2N4401	Q1-Q4
	28			
	27			
29	26	910504650	LED.	DS3-DS31
	25			
	24			
	23			
	22			
	21			
	20			
1	19	920204076	I.C. 4076	U18
1	18	920207402	74C02	U17
2	17	920274923	74C923	U13,U14
1	16	920374245	74LS245	U12
1	15	920374138	74LS138	U11
1	14	920207410	74C10	U10
1	13	920207404	74C04	U8
4	12	920204030	4030B	U6,U7
	11			U15,U16
2	10	920274374	74C374	U4,U5
1	9	920274911	74C911	U3
2	8	920207211	I.C. ICM.7211A	U1,U2
	7			
	6			
	5			
	4			
	3			
1	2	904500724	A12 PWB (C03364400)	
REF	1	D03362300	A12 PWB ASSY	
QTY	ITEM	PART NO.	DESCRIPTION	REF.

QTY	ITEM	PART NO.	DESCRIPTION	REF.
	74			
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	52			
29	51	915800065	SPACERS LEDS 3/16	REF:DS3-31
	50			
	49			
1	48	914800387	CONN, RT ANGLE, 16 PIN	J2
1	47	916400152	KYBD/DSPL. I/O CABLE ASSY	J1
	46			
	45			
	44			
2	43	902710106	CAPACITOR, 10μF, 20 V TANT	C6,C8
	42			
5	41	901300104	CAPACITOR, .1μF, 20%	C1,C4,C5
	40			C7,C9
3	39	901300474	CAPACITOR, .47μF	C2,C3,
	38			C10

QTY	ITEM	PART NO.	DESCRIPTION	REF.
	37			
	36			
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	23			
	22			
	21			
	20			
	19			
1	18	914800242	CONNECTOR, 2PIN	J3
2	17	914800392	CONNECTOR, 10 PIN WAFER	J1, J4
	16			
	15			
1	14	906900105	RESISTOR, 1 M, 1/4W, 5%	R1
	13			
	12			
2	11	912600095	RELAY, DPDT	K1, K2
	10			
	9			
6	8	913100007	SPARK GAP PROTECTOR	OVP1-OVP6
	7			
	6			
1	5	911300081	SWITCH ASSY (C03392100)	S1-S6
2	4	800004030	SCREW BH 2-56 X 1/4	
1	3	C03436200	MOUNTING BRKT INTERFACE A	
1	2	904500760	A13 P.W.B (C03360500)	
REF	1	D03360600	A13 P.W.B. ASSY	

QTY	ITEM	PART NO.	DESCRIPTION	REF.
2	30	819204019	WASHER, #4 SPLIT LOCK	
2	29	816525012	WASH #4 FIBRE	
1	28	914800393	16 PIN WAFER CONNECTOR	J1
	27			
1	26	911300080	SWITCH ASSY (C03392200)	
2	25	800004030	SCREW BH 2-56 X 5/16	
	24			
2	23	910505357	DIODE, IN5357, 20V, 5W ZENER	CR1, CR2
4	22	910804005	DIODE IN4005, 50V 1 AMP SILICON	CR3 — CR6
4	21	910504001	DIODE IN4001,	CR7 — CR10
	20			
4	19	902200606	CAPACITOR, 60 μf, 150V $^{+10}_{+50}$%	C1 — C4
	18			
1	17	916400157	FLEX STRIP 10 COND.	
	16			
3	15	906900103	RESISTOR, 10K, 1/4W 5%	R11, R12, R13
1	14	907309090	909 Ω 1/8W 1%	R17
1	13	907308870	887Ω 1/8W 1%	R9
2	12	907308060	806Ω 1/8W 1%	R2, R5
2	11	907456R20	56.2Ω 1/2W 1%	R1, R4
1	10	907406980	698Ω 1/2W 1% MF	R10,
2	9	907304320	432 Ω 1/8W 1%	R3, R6
1	8	907402050	205Ω 1/2W 1% MF	R14
2	7	907403160	316 Ω 1/2W 1%	R7, R8
2	6	905400180	RESISTOR, 18Ω, 1W, 5%	R15, R16
10"	5	8130-0081	WIRE 18GA WHITE	REF L1, L2
	4			
1	3	C03436300	LINE INTERFACE BKT "B"	
	2	904500726	A14 P.W.B. (C0 3361000)	
REF	1	D03361100	A14 P.W.B. ASSY	

Qty.	Item No.	Part or Identifying No.	Description	Spec or Note
8	1	KT102 Series	Teradyne Minimax Insulator	Mfg. P/N
802	2	KT102 Series	Teradyne Minimax Contact	Mfg. P/N
9	3	USECO 1280D	Solid Turret Terminal	
1	4	SAE 22 D/2-NE	P.C.B. Edge Connector	
1	5	3433-4205	3M 50 Pin Connector	
1	6	3505-2	3M Connector Locker	
1	7	C03413700	P.C. Backplane	

	37			
	36			
	35			
	34			
8	33	910504148	DIODE, IN4148	CR1, CR2
	32		CR4, CR5, CR6, CR8,	CR9, CR10
2	31	910635263	DIODE, IN5263B	CR3, CR7
2	30	910800068	DIODE, VM68	CR11, CR12
2	29	910630961	ZENER DIODE, IN961B, 10V	CR15, 16
2	28	910635247	ZENER DIODE IN5247, 17V, 5%, 500MW	CR13, 14
	27			
3	26	901320474	CAPACITOR, 0.47 μf 20% CER.	C1, C2, C15
1	25	901910560	56 pf, 2%	C3
3	24	901300104	0.1 μf, 20% CER.	C4, C5, C10
2	23	901330104	0.1 μf, 10%	C9, C13
2	22	901410502	0.005 μf, 10% CER.	C6, C11
4	21	901910101	CAPACITOR, 100 pf, 2%	C7, C8
				C12, C14
2	19	902220106	CAPACITOR, 10 μF, 25V.	C16, C17
	18			
4	17	906900152	RESISTOR, 1.5K, 1/4W, 5%	R23, 24, 25, 26
2	16	907309093	RESISTOR 909K, 1/8W, 1%	R12, R22
2	15	907301004	1M, 1/8W, 1%	R11, R21
2	14	907305111	5.11K, 1/8W, 1%	R10, R20
2	13	907324R30	24.3Ω, 1/8W, 1%	R9, R19
2	12	907301001	1K, 1/8W, 1%	R8, R18
2	11	906900754	750K, 1/4W, 5%	R7, R17
2	10	906900202	2K, 1/4W, 5%	R5, R15
	9			
2	8	905400104	100K, 1W, 5%	R3, R13
5	7	906900103	10K, 1/4W, 5%	R2, 4, 6, 14, 16
1	6	906900203	RESISTOR, 20K, 1/4W, 5%	R1
	5			
	4			
	3			
1	2	904500752	A17 PWB (C03385700)	
REF	1	C03400900	A17 PWB ASSY	
QTY	ITEM	PART NO.	DESCRIPTION	REF.

	74			
	73			
	72			
	71			
	70			
	69			
	68			
	67			
	66			
	65			
	64			
	63			
	62			
1	61	914800327	CONNECTOR - 6 POS. PCB MOUNT	J1
1	60	914800277	CONNECTOR-4 POS. PCB MOUNT	J2
	59			
	58			
	57			
3	56	909910013	TRANSFORMER	T1,T2,T3
	55			
4	54	919200068	FERRITE BEADS	L5.6.9.10
4	53	909000184	INDUCTOR, 3.3MH	L3.4.7.8
2	52	909000146	INDUCTOR, 22μH	L1,L2
	51			
	50			
	49			
4	48	910303904	TRANSISTOR, 2N3904	Q1,3,6,8
	47			
2	46	910310089	TRANSISTOR, VN89AF	Q4,Q9
2	45	910306516	TRANSISTOR, 2N6516	Q5,Q10
	44			
	43			
	42			
1	41	920204049	I.C. CD4049	U1
2	40	920300580	I.C. AD580K	U2,5
2	39	920300308	I.C. LM308AN	U3,4
	38			
QTY	ITEM	PART NO.	DESCRIPTION	REF.

	38			
	37			
	36			
	35			
	34			
	33			
2	32	808304007	ELASTIC STOP NUT, #4-40	
1	31	D03398300	INPUT JACK- A13 HARNESS ASSY	
	30			
	29			
1	28	C03498200	INSULATOR	
	27			
7	26	800004086	SCREW, BH, #4-40	
5	25	816501013	WASHER, BRASS, #4	
6	23	800004085	SCREW, B.H., 4-40	
6	22	808001007	NUT, HEX, 4-40	
13	21	819204019	WASHER, SPLITLOCK, #4	
13	20	816501012	WASHER, FLAT, #4	
3	19	80004084	SCREW, B.H., 4-40	
4	18	809402007	NUT, KEP, 4-40	
3	17	819102059	WASH, INT LOCK, 1/2 IN	
8	16	816525026	WASH, FIBER, # 4	
4	15	816501013	WASH, FLAT, #4	
4	14	914800391	ZEBRA STRIPS, 1.15×.50×3.715	A03399100
2	13	922100001	L.C.D. DISPLAY (C03343600)	
	12			
	11			
	10			
2	9	D03375000	HOUSING, L.C.D.	
1	8	D03421200	FRAME, L.C.D.	
	7			
	6			
	5			
1	4	C03421400	A13/14 ASSY	
1	3	A03362200	A12 PWB ASSY L/M	
1	2	922500003	ASSY FRONT PANEL LABEL	D03430200
REF	1	D03379600	FRONT PANEL ASSY	
QTY	ITEM	PART NO.	DESCRIPTION	REF.

According to Engineering Change Order # 19506, make the following changes to the parts list for the Final Assembly:

Add:	Qty.:	8
	Item:	31
	Part #:	809402007
	Description:	Kep nut 4/40
	Ref:	N/A

NOTE: The preceding addition will make a total quantity of 9 kep nuts Part # 809402007 on the parts list.

Add:	Qty.:	4
	Item:	28
	Part #:	B03598000
	Description:	Bracket
	Ref:	N/A

SECTION 8

SCHEMATICS

8.1 INTRODUCTION

8.1.1 Section 8 includes schematics for each subassembly of the 812A test set. Assembly drawings of the Front Panel and the Final Assembly are also included. Please see introduction to Section 7 for more information on test set improvements and changes.

The schematics are arranged in the following order:

A1 Central Processing Unit (CPU), Computer and Clock Generator
A2-1 Memory Expansion
A4 Converter
A5A Filter Gain
A5B Filter Gain
A8 Transmitter
A11 Power Supply
A12 Display Driver
A13 Line Interface A
A14 Line Interface B
A16 Backplane
A17 Holding Circuit
Front Panel
Final Assembly

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REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
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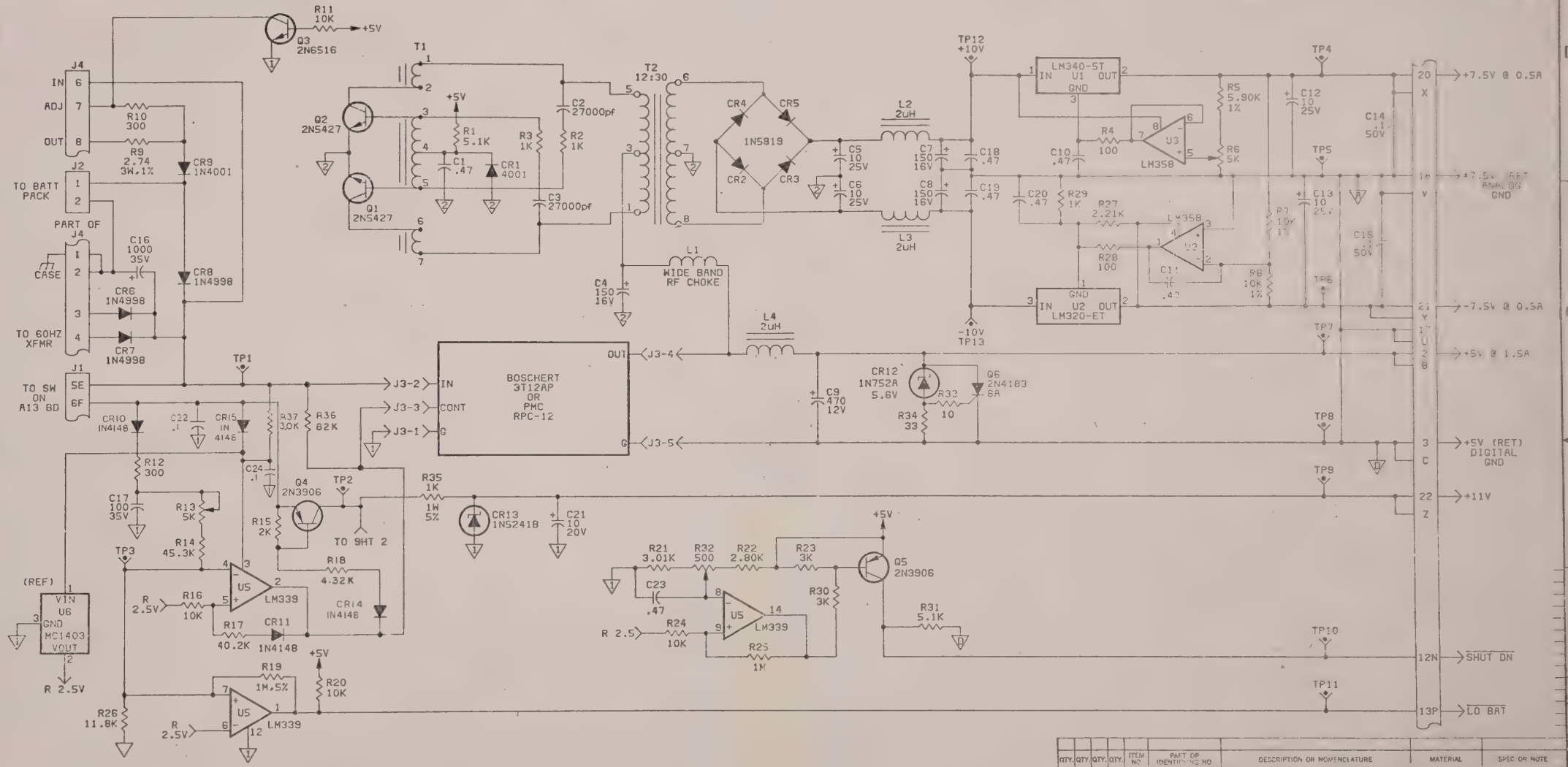
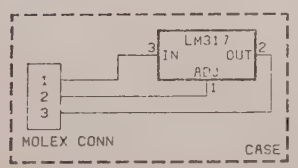
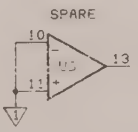
	B	PER ECO 19184	4/6-84	







NOTES: SEE SHEET 3

COMPONENT DESIGNATOR		
FIRST USED	LAST USED	NOT USED
U1	U6	U4
Q1	Q6	-
L1	L4	-
T1	T2	-
CR1	CR15	-
C1	C2	-
R1	R3	-

IC POWER PIN-OUT							
REF DESIG	IC TYPE	+5V	D GND	+7.5V	R GND	-7.5V	CASE GND
U1	LM340						
U2	LM320						
U3	LM358						
U5	LM339	3					12
U6	MC1403						3

QTY.	QTY.	QTY.	ITEM NO	PART OR IDENTIFYING NO	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
					LIST OF MATERIAL OR PARTS LIST		

ALL THREADS UNIFIED SERIES EXTERNAL THREADS TO BE CLASS 2A UNLESS OTHERWISE SPECIFIED

FINISH ON ALL MACHINED SURFACES UNLESS OTHERWISE SPECIFIED REMOVE ALL BURRS AND SHARP EDGES

DO NOT SCALE DWG.

DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

Sierra, A DIVISION OF LEAR SIEGLER INC. MENLO PARK, CALIFORNIA 94025

CODE IDENT. NO 54778

SCHEMATIC, All PWB POWER SUPPLY

DATE	SIZE	DRAWING NO.	REV
10-30-80	D	D03498300	

SCALE	STOCK AS	SHEET
NONE		

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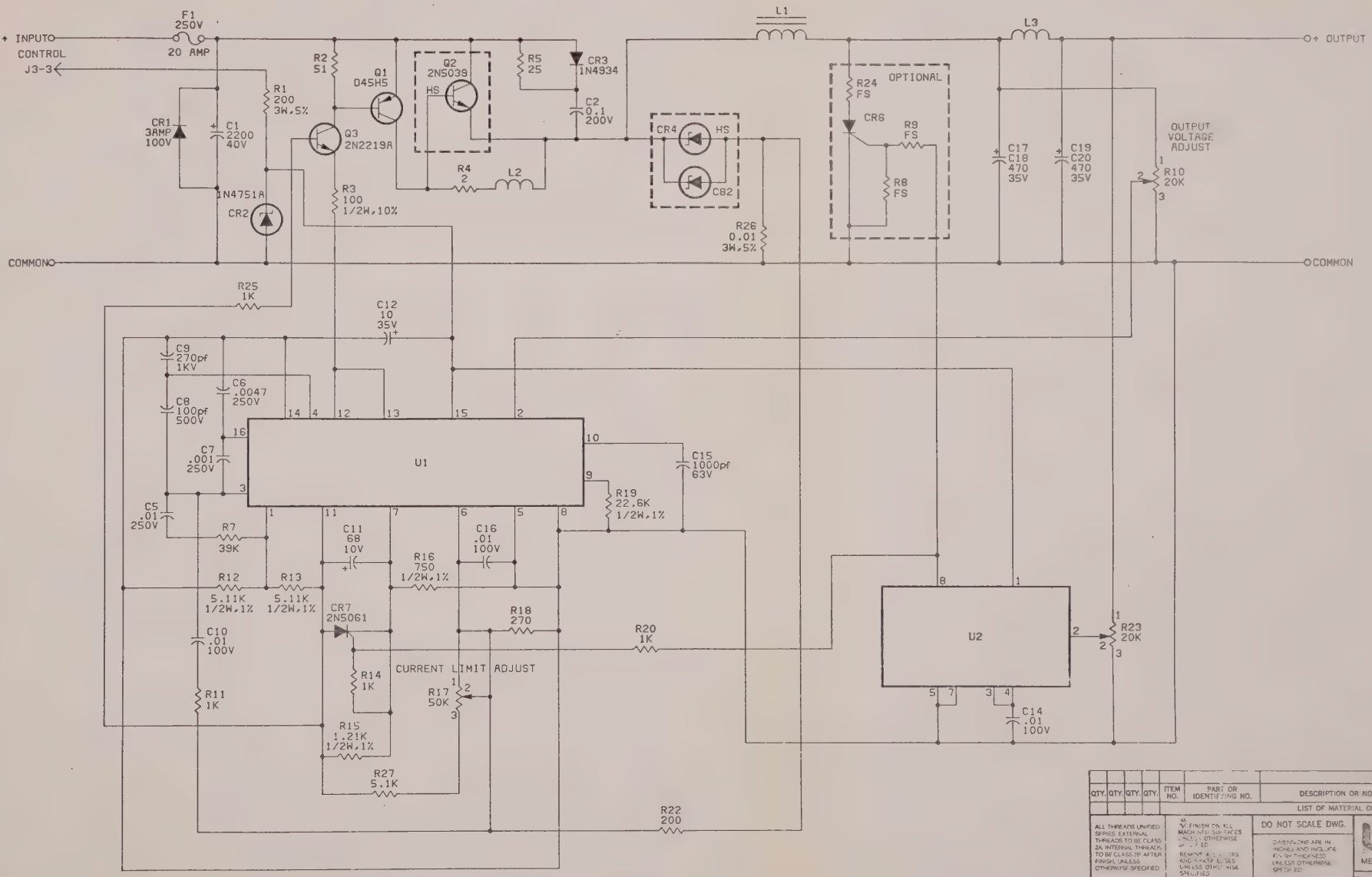
ZONE	LTR	REVISIONS DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



QTY.	QTY.	QTY.	ITEM NO.	PART OR IDENTIFYING NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
					LIST OF MATERIAL OR PARTS LIST		

ALL THREADS UNIFIED SERIES EXTERNAL THREADS TO BE CLASS 2A INTERNAL THREADS TO BE CLASS 2B AFTER FINISH UNLESS OTHERWISE SPECIFIED

63 FINISH ON ALL MACHINED SURFACES UNLESS OTHERWISE NOTED REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DWG.

DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

TOLERANCE UNLESS SPECIFIED		
BASIC	TWO PLACE	THREE PLACE
UP TO 6	± .02	±
6 TO 24	± .03	±
ABOVE 24	± .06	±
ANGULAR DIMENSION ±		

FINISH:

Sierra, A DIVISION OF LEAR SIEGLER, INC.
MENLO PARK, CALIFORNIA 94025

CODE IDENT. NO 54778

SCHEMATIC, POWER SUPPLY (POWER MATE MODULE ONLY)

ASSY. OR ITEM	QTY. NEXT	NEXT ASSY.	MODEL NO.
00		SEE SHT 1	812A
APPLICATION			

DATE 10-7-81
BY J. RICH
CHECKED
APPR

SIZE D | DRAWING NO. D03498300 | REV F

SCALE NONE | STOCK AS | SHEET 2 OF 3

D03498300

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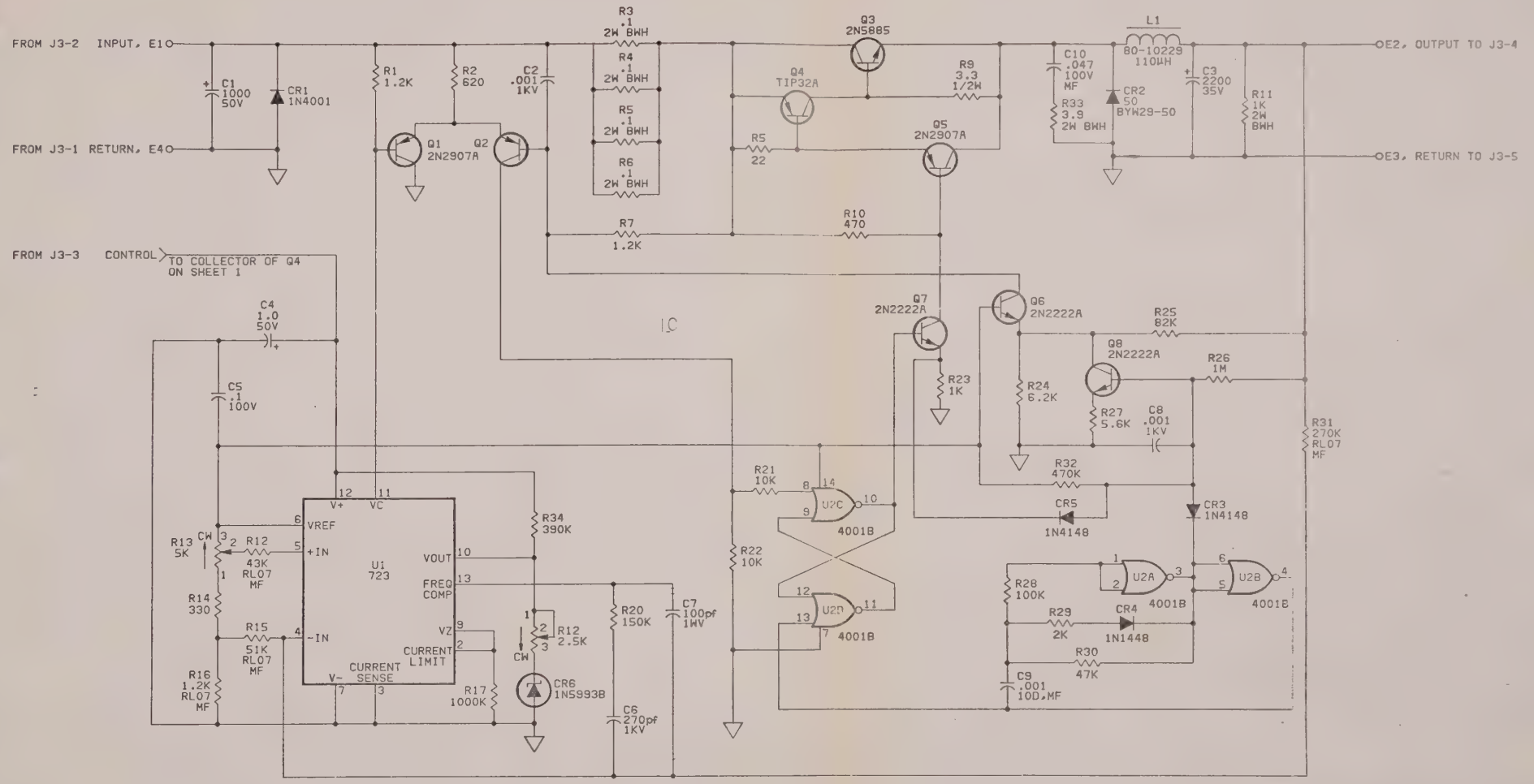
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



1. CAPACITANCE IS IN MICROFARADS, RESISTANCE IS IN OHMS, 1/4 WATT, CARBON FILM.

NOTES: UNLESS OTHERWISE SPECIFIED

QTY	QTY	QTY	QTY	ITEM NO	IDENT DR NO	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
						LIST OF MATERIAL OR PARTS LIST		

ALL THREADS UNIFIED SERIES EXTERNAL THREADS TO BE CLASS 2A, INTERNAL THREADS TO BE CLASS 2B AFTER FINISH, UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DWG.

DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

TOLERANCE UNLESS SPECIFIED

BASIC	TWO PLACE	THREE PLACE
UP TO 6	± .01	±
6 TO 24	± .01	±
ABOVE 24	± .06	±
ANGULAR D. MENSION	±	
FINISH		

Sierra, A DIVISION OF LEAR SIEGLER INC. MENLO PARK, CALIFORNIA 94025

CODE IDENT NO 54778

SCHEMATIC, POWER SUPPLY (BOSCHERT MODULE ONLY)

DATE	SIZE	DRAWING NO.	REV
10-5-81	D	D03498300	B

BY	CHECKED	APVR	SCALE	STOCK AS	SHEET
R. RICH		—	NONE	—	3 OF 3

QTY	ASSY OR ITEM	NEXT ASSY	MODEL NO
00	APPLICATION	SEE SHT 1	8128

DIFFUSION 1500SD NEW JERSEY

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CLOCK GENERATOR

RESET CIRCUITRY

FREQUENCY DIVIDERS

DATA BUS

ADDRESS BUS

PART OF J1

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	PER SCO		

Sierra
CODE IDENT NO. 54778
MENLO PARK CALIFORNIA 94025

SCHEMATIC, CPU A1 PWB
COMPUTER & CLOCK GENERATOR

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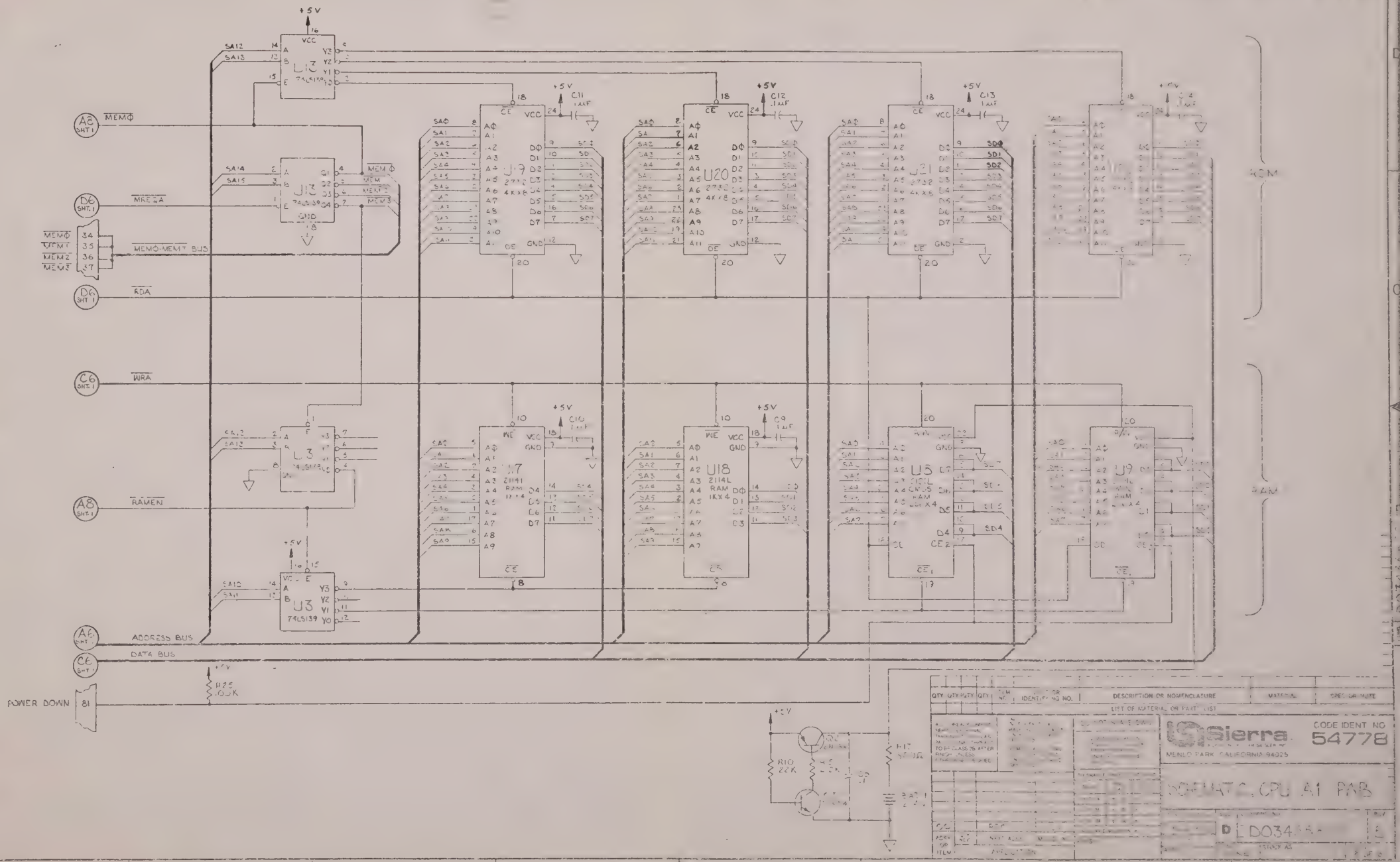
SEE SHEET ONE...



QTY	QTY	QTY	QTY	ITEM NO.	IDENT. OR DWG NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE

LIST OF MATERIAL OR PART LIST

Sierra
MENLO PARK CALIFORNIA 94025

CODE IDENT NO 54778

SCHEMATIC, CPU A1 PWB

D D0345 REV

SCALE AS

SHEET 2 OF 6

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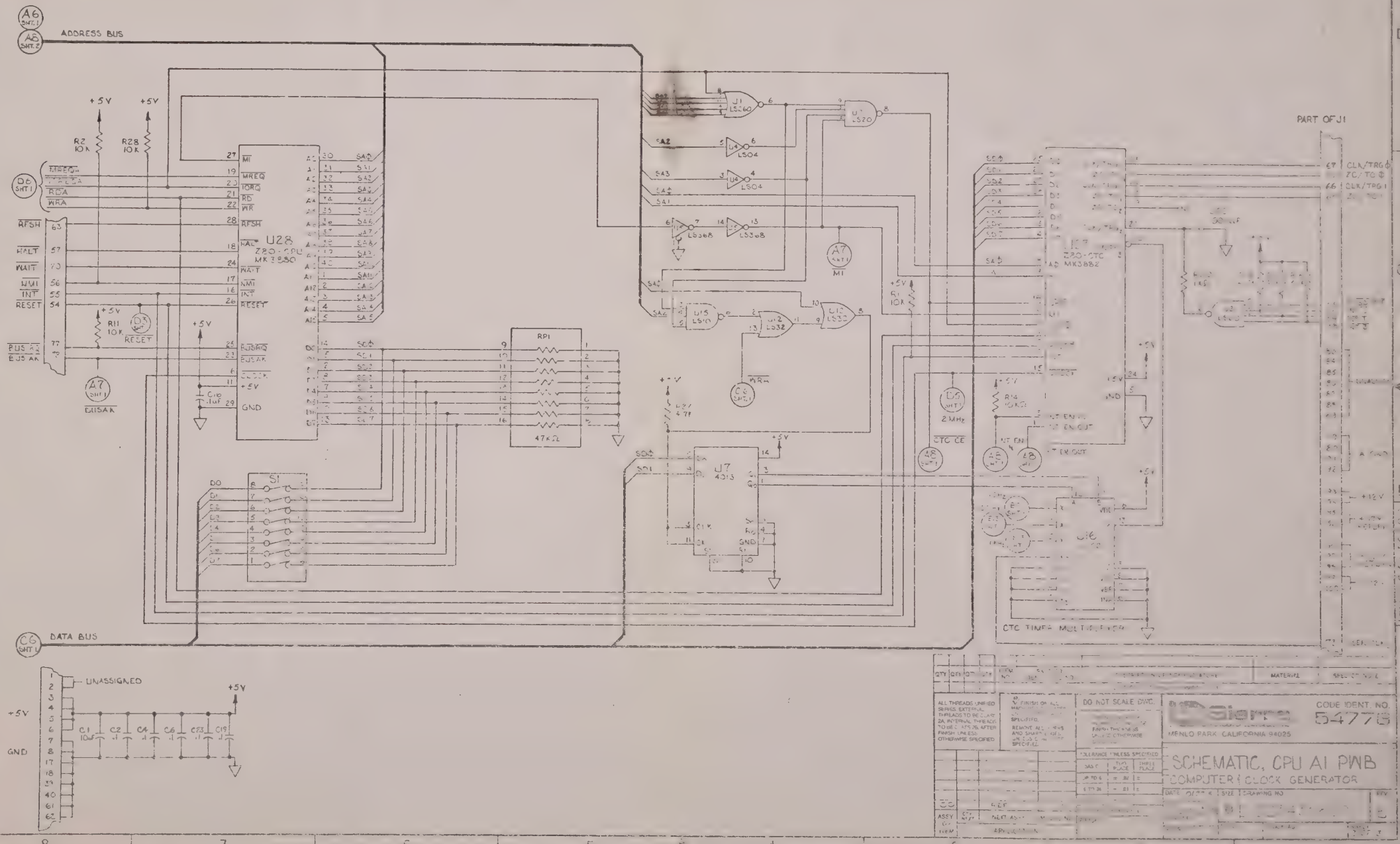
ZONE LTR	REVISIONS DESCRIPTION
	SEE SHEET ONE ....



QTY	QTY	MATERIAL

ALL THREADS UNIFIED SERIES EXTERNAL THREADS TO BE CLASS 2A INTERNAL THREADS TO BE CLASS 2B AFTER FINISH UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DWG.

TOLERANCE UNLESS SPECIFIED

	TWO PLACE	THREE PLACE
ANGLES	± .01	
.XX	± .01	
.XXX		± .005

Sierra

MENLO PARK CALIFORNIA 94025

CODE IDENT. NO. 54776

SCHEMATIC, CPU A1 PWB
COMPUTER | CLOCK GENERATOR

DRAWING NO.

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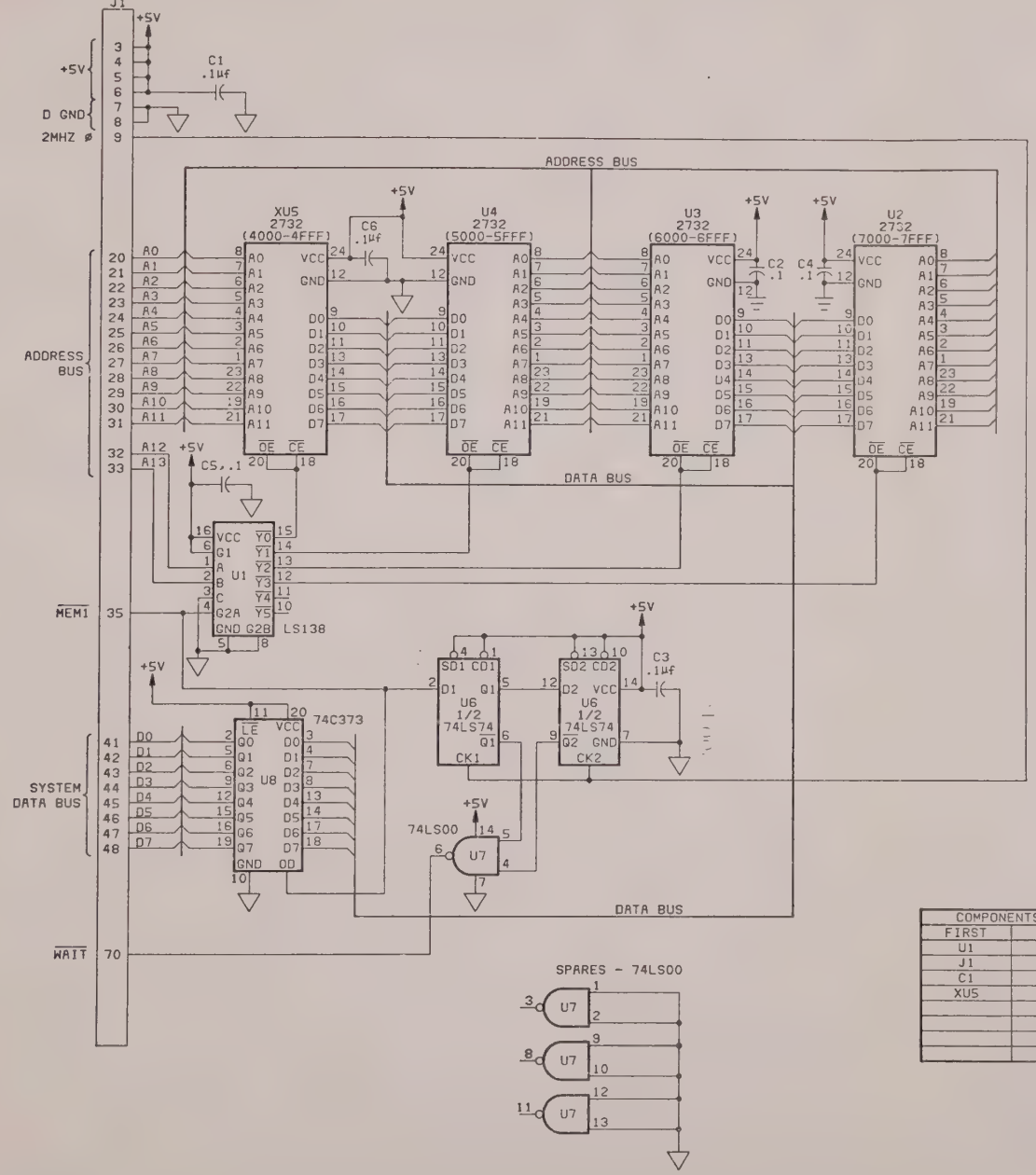
REVISIONS			
ZONE	LTR	DESCRIPTION	DATE / APPROVED
	A1	PER ECO 18831	



COMPONENTS DESIGNATION		
FIRST	LAST	NOT USED
U1	U8	U2,3,4
J1	J1	-
C1	C6	-
XU5	XU5	-

QTY	QTY	QTY	ITEM NO.	PART OR IDENTIFYING NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
					LIST OF MATERIAL OR PARTS LIST		

ALL THREADS UNIFIED SERIES, EXTERNAL THREADS TO BE CLASS 2A, INTERNAL THREADS TO BE CLASS 2B, AFTER FINISH, UNLESS OTHERWISE SPECIFIED

FINISH ON ALL MACHINED SURFACES UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DWG.

DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

TOLERANCE UNLESS SPECIFIED: BASIC, TWO PLACE, THREE PLACE

Sierra, A DIVISION OF LEAR SIEGLER INC. MENLO PARK, CALIFORNIA 94025

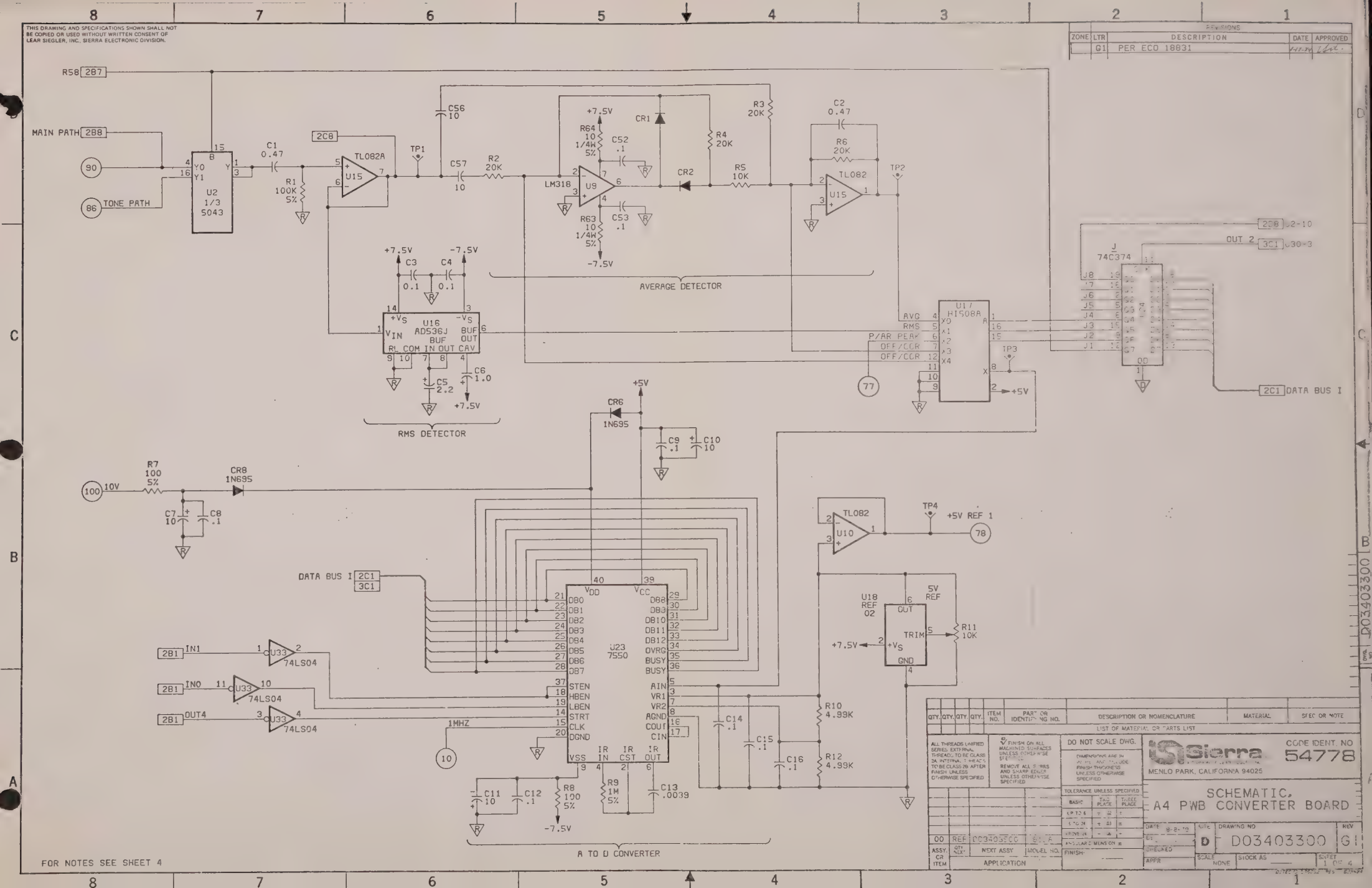
CODE IDENT. NO 54778

SCHEMATIC
A2-1 PWB
MEMORY EXPANSION

00	REF	D03412201	B	2R		
ASSY OR ITEM	QTY NEXT	NEXT ASSY	MODEL NO.	FINISH		
APPLICATION						

DATE 10/13/81 | BY CAD | CHECKED | APPR | SIZE D | DRAWING NO. D03436900 | REV A1 | SCALE | SHOCK AS | WEL

D03436900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REVISIONS
ZONE LTR DESCRIPTION DATE APPROVED
G1 PER ECO 18031
R58 287
MAIN PATH 288
90
86 TONE PATH
U2 1/3 5043
C1 0.47
R1 100K 5%
2C8
TL082A U15
TP1
C56 10
C57 10
R2 20K
+7.5V
R64 10 1/4W 5%
C52 .1
CR1
R3 20K
R4 20K
C2 0.47
R6 20K
LM318 U9
CR2
R5 10K
TL082 U15
TP2
R63 10 1/4W 5%
C53 .1
-7.5V
AVERAGE DETECTOR
+7.5V -7.5V
C3 0.1
C4 0.1
U16 AD536J BUF
C5 2.2
C6 1.0
RMS DETECTOR
U17 HI508A
AVG
RMS
P/AR PEAK
OFF/CCR
77
TP3
+5V
2C8 2-10
OUT 2 3C1 30-3
J 74C374
2C1 DATA BUS I
+5V
CR6 1N695
C9 .1
C10 10
100 10V
R7 100 5%
CR8 1N695
C7 10
C8 .1
TL082 U10
TP4
+5V REF 1
78
DATA BUS I 2C1 3C1
U23 7550
DB0 DB1 DB2 DB3 DB4 DB5 DB6 DB7
STEN HBEN LBEN STRT CLK DGND
DB8 DB9 DB10 DB11 DB12 OVRG BUSY BUSY
AIN VR1 VR2 AGND COUT CIN
VSS IR IN IR CST IR OUT
U18 REF 02
5V REF
OUT TRIM +VS GND
R11 10K
+7.5V
2B1 IN1 U33 74LS04
2B1 IN0 U33 74LS04
2B1 OUT4 U33 74LS04
1MHZ
10
C14 .1
C15 .1
C16 .1
R10 4.99K
R12 4.99K
C11 10
C12 .1
R8 100 5%
R9 1M 5%
C13 .0039
-7.5V
A TO D CONVERTER
FOR NOTES SEE SHEET 4
QTY. QTY. QTY. ITEM NO. PART OR IDENTIFYING NO. DESCRIPTION OR NOMENCLATURE MATERIAL SPEC OR NOTE
LIST OF MATERIAL OR PARTS LIST
ALL THREADS UNIFIED SERIES, EXTERNAL THREADS TO BE CLASS 3A, INTERNAL THREADS TO BE CLASS 2B AFTER FINISH UNLESS OTHERWISE SPECIFIED
FINISH ON ALL MACHINED SURFACES UNLESS OTHERWISE SPECIFIED
REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED
DO NOT SCALE DWG.
DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED
TOLERANCE UNLESS SPECIFIED
BASIC TWO PLACE THREE PLACE
UP TO 6 ± .01 ± .005
OVER 6 UP TO 24 ± .03 ± .01
OVER 24 ± .06 ± .03
ANGULAR MEASURE ±
FINISH:
APPLICATION
NEXT ASSY
MODEL NO.
00 REF D03403300 SCH
ASSY. OR ITEM QTY. NEXT
Sierra
MENLO PARK, CALIFORNIA 94025
CODE IDENT. NO 54778
SCHEMATIC, A4 PWB CONVERTER BOARD
DRAWN
CHECKED
APPR
DATE 8-8-79
SIZE D
DRAWING NO D03403300
REV G1
SCALE NONE
STOCK AS
SHEET 1 OF 4
D03403300 G1

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REVISIONS			
ZONE	LTR	DESCRIPTION	DATE APPROVED
		SEE SHEET 1	

FREQUENCY COUNTER

PHASE LOCK LOOP

AUDIO OUTPUT SECTION

MAIN PATH/ TONE PATH

MAIN PATH/ AUTO RANGE

X5 1D1 TO U24-19

1D8 U24-12

U30-8 3B1 OUT7

U30-4 3B1 OUT 3

DATA BUS I 3C1 C1 1B6

DATA BUS I 1B6 3C1 R6

IN2 3B1 U30-11

IN3 3B1 U30-13

3D6 U21-11

3D6 U21-10

3D6 U21-9

QTY	QTY	QTY	QTY	ITEM NO	PART OR IDENTIFYING NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
						LIST OF MATERIAL OR PARTS LIST		

ALL THREADS UNIFIED SERIES, EXTERNAL THREADS TO BE CLASS 2A, INTERNAL THREADS TO BE CLASS 2B AFTER FINISH, UNLESS OTHERWISE SPECIFIED

FINISH ON ALL MACHINED SURFACES UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED.

DO NOT SCALE DWG.

DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

TOLERANCES UNLESS SPECIFIED	BASIC	TWO PLACE	THREE PLACE
UP TO 6		± .02	±
6 TO 24		± .03	±
ABOVE 24		± .06	±
ANGULAR DIMENSION		±	

Sierra A DIVISION OF LEAR SIEGLER INC. MENLO PARK, CALIFORNIA 94025

CODE IDENT NO 54778

SCHEMATIC, A4 PWB CONVERTER BOARD

QTY	REF	DRAWING NO	REV
00	REF	D03403500	B 2A

ASSY OR ITEM	QTY NEXT	NEXT ASSY.	MODEL NO.
		APPLICATION	

DATE	SIZE	DRAWING NO	REV.
8-6-79	D	D03403300	G1

BY R.E. SWASEY
CHECKED
APPR
SCALE NONE
STOCK AS
SHEET 2 OF 4

D03403300

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REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		

+5V REF 1

R39 2.15K
R40 1.96K
R41 1.74K
R42 1.50K
R43 1.37K
R44 11.3K

2A6 U25-19
2A6 U25-2
2A6 U25-16

U21 4051 (C B A, X0–X7, OUT, VSS VEE INH)

U22A LM339 — R49 100K 5%
U22B LM339 — R50 100K 5%
U22C LM339 — R51 100K 5%
U22D LM339 — R54 100K 5%

U34A 4013 — U27A 4013 — U34B 4013 — U27B 4013 (S CLK R D Q)

LARGE
MEDIUM
SMALL

74C373 (LE, D0–D7, Q0–Q7, OE)

DATA BUS I

RN1 10K
RN2 10K
C67 .1

SN74LS245 (DIR, A1–A8, B1–B8) — DATA BUS

WR 53

DATA BUS I 2C1 1B6 2A6

C63 .47
R45 1K
U8 TL084 — 0dB
R46 11.8K — -4dB
R47 7.32K — -8dB
R48 2.55K — -10dB
R57 10K
R21 4.7K 5%

ADVANCE OVERANGE PEAK DETECTOR

IN 4 381 U30-14

CR4 CR5
R36 49.9K
R37 24.9K
R38 39.2K
R69 20K
TP8 TP9
C26 0.47
C27 0.47
C28 56pf
R34 49.9K
R35 49.9K
2B8
U8A TL084
U8B TL084

IMPULSE NOISE

74LS27 U31 — 74LS10 U32

A7 A6 A4 A5 MREQ
MI IORQ

U30 74LS154

A0 A1 A2 A3

OUT 0 63
OUT 1 64
OUT 2 1C1 U24-11
OUT 3 2A8 U25-11
OUT 4 1A7
OUT 5 74
OUT 6 66
OUT 7 2B4 U33-13
IN 0 1B7
IN 1 1A7
IN 2 2D1 U7-1
IN 3 2B1 U14-1
IN 4 3C5
IN 5 71
IN 6 72
OUT 8 73

ADDRESS DECODE

SPARES

U33 74LS04
U8 TL084

RESISTOR PACK SPARES

RN1 RN2

QTY	QTY	QTY	QTY	ITEM NO.	PART OR IDENT. NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE

LIST OF MATERIAL OR PARTS LIST

ALL THREADS UNIFIED SERIES EXTERNAL THREADS TO BE CLASS 2A INTERNAL THREADS TO BE CLASS 2B AFTER FINISH UNLESS OTHERWISE SPECIFIED

MACHINED SURFACES UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DWG.

DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

TOLERANCE UNLESS SPECIFIED

BASIC	TWO PLACE	THREE PLACE
UP TO 6	± .02	±
+ TO 24	± .03	±
ABOVE 24	± .06	±

ANGULAR DIMENSION ±

FINISH:

Sierra
MENLO PARK, CALIFORNIA 94025
CODE IDENT NO 54778

SCHEMATIC, A4 PWB
CONVERTER BOARD

ASSY. OR ITEM	QTY NEXT	NEXT ASSY	MODEL NO.
00	REF	D03403500 ; S:2A	
APPLICATION			

DATE 9-28-79
CHECKED
APPR

SIZE D | DRAWING NO. D03403300 | REV. G1

SCALE NONE | STOCK AS ____ | SHEET 3 OF 4

D03403300

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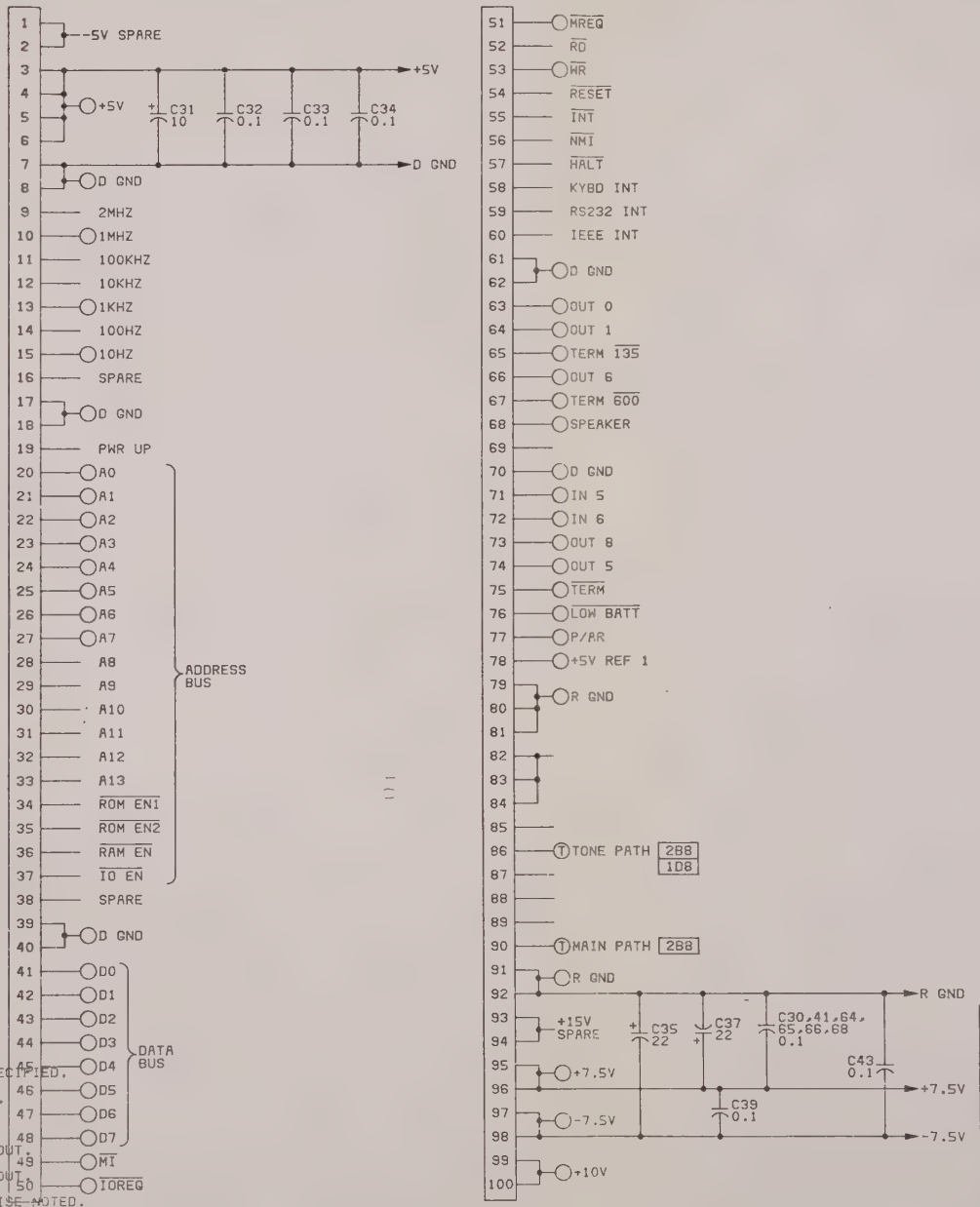
BACKPLANE BUS DESIGNATIONS CPU PINOUTS



REVISIONS			
ZONE	LTR	DESCRIPTION	DATE APPROVED
		SEE SHEET 1	

LAST USED	NOT USED
R70	R32,53,55,56
G1	
CR7	
U34	U12
TP10	
C68	C20,22,29,36, C38,40,42,44, C45,46,47,54, C55,58

IC POWER PIN-OUT

REF DESIG	IC TYPE	+5V	D GND	+7.5V	R GND	-7.5V
U1,4	LM311			8		4
U2	HIS043	12		11	13	14
U3	MC14046			16		8,5
U5,26,27,34	CD4013B	14	7			
U6,13	MC14520	16	8			
U7,14,28	MM74C373	20	10			
U8	TL084			4		11
(1) U9	LM318N			7		4
U10,15	TL082			8		4
U11	MM74C90			5		10
U16	AD536J			14		3
U17	HIS08A	2	14	13	9,10,11	3
U18	REF02CJ			2	4	
U19	LM386		4	6		
U20	CD4051B	16	8			7
U21	CD4051	16	8,7			
U22	LM339		12	3		
U23	AD7550	39	20		8	
U24,25	MM74C374	20	10			
U29	SN74LS245	20	10			
U30	74LS154	24	12			
U31	74LS27	14	7			
U32	74LS10	14	7			
U33	74LS04	14	7			

INDICATES SHEET NUMBER
INDICATES HORIZONTAL ZONE
8. 2C8 INDICATES VERTICAL ZONE

7. ALL DIODES ARE 1N4148 UNLESS OTHERWISE SPECIFIED.
6. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
5. ALL RESISTANCE VALUES ARE IN OHMS.
4. CONNECT ALL (D) GND TOGETHER ON ACTUAL LAYOUT.
3. CONNECT ALL (R) GND TOGETHER ON ACTUAL LAYOUT.
2. ALL RESISTORS ARE 1%, 1/8W, UNLESS OTHERWISE NOTED.
(1.) VOLTAGES INDICATED HERE ARE BEFORE R63 & R64.
NOTES: UNLESS OTHERWISE SPECIFIED:

QTY.	QTY.	QTY.	QTY.	ITEM NO.	PART OR IDENTIFYING NO	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
						LIST OF MATERIAL OR PARTS LIST		

ALL THREADS UNIFIED SERIES EXTERNAL THREADS TO BE CLASS 2A INTERNAL THREADS TO BE CLASS 2B AFTER FINISH UNLESS OTHERWISE SPECIFIED

63 FINISH ON ALL MACHINED SURFACES UNLESS OTHERWISE SPECIFIED
REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED.

DO NOT SCALE DWG.
DIMENSIONS ARE IN INCHES AND TOLERANCE UNLESS OTHERWISE SPECIFIED

TOLERANCE UNLESS SPECIFIED		
BASIC	TWO PLACE	THREE PLACE
UP TO 6	± .02	±
6 TO 24	± .03	±
ABOVE 24	± .5	±
ANGULAR DIMENSION ±		
FINISH:		

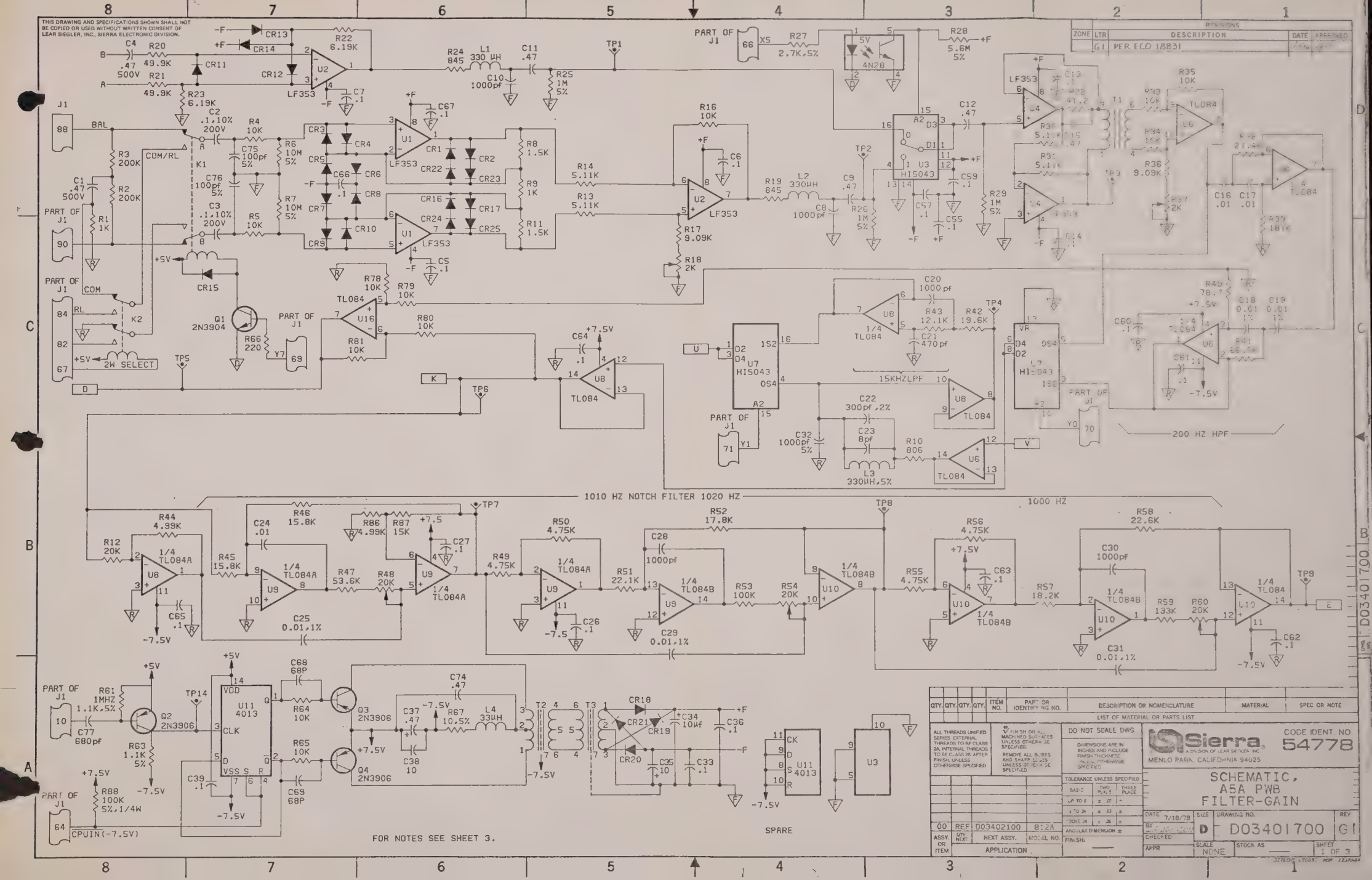
Sierra — A DIVISION OF LEAR SIEGLER INC.
MENLO PARK, CALIFORNIA 94025
CODE IDENT NO 54778

SCHEMATIC, A4 PWB CONVERTER BOARD

ASSY. OR ITEM	QTY NEXT	NEXT ASSY	MODEL NO
00	REF D03403500		A2A
APPLICATION			

DRAWN 9-25-79 | CHECKED | APPR
SIZE D | DRAWING NO. D03403300 | REV. G1
SCALE NONE | STOCK AS ____ | SHEET 1 OF 4

D03403300


1010 HZ NOTCH FILTER 1020 HZ
1000 HZ
200 HZ HPF
15KHZLPF
SPARE
FOR NOTES SEE SHEET 3.
SCHEMATIC, A5A PWB FILTER-GAIN
Sierra
MENLO PARK, CALIFORNIA 94025
CODE IDENT. NO. 54778
D03401700 G1
SHEET 1 OF 3

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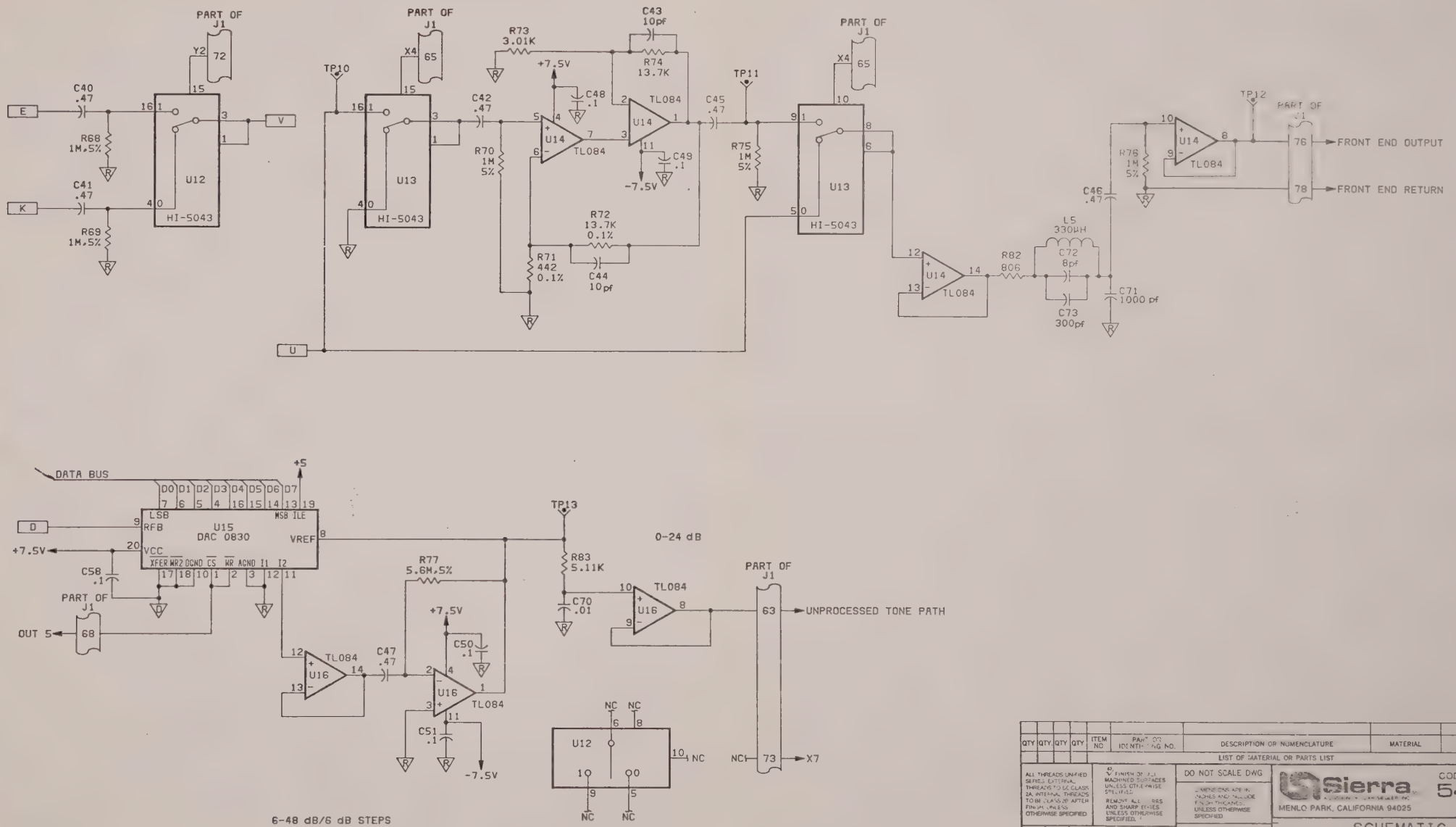
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



QTY	QTY	QTY	QTY	ITEM NO	PART OR IDENTIFYING NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
						LIST OF MATERIAL OR PARTS LIST		

ALL THREADS UNIFIED SERIES EXTERNAL THREADS TO BE CLASS 2A INTERNAL THREADS TO BE CLASS 2B AFTER FINISH UNLESS OTHERWISE SPECIFIED

FINISH OF ALL MACHINED SURFACES UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED.

DO NOT SCALE DWG

DIMENSIONS ARE IN INCHES AND TOLERANCE PER DIMENSIONS UNLESS OTHERWISE SPECIFIED

TOLERANCE UNLESS SPECIFIED		
BASIC	TWO PLACE	THREE PLACE
UP TO 6	± .02	±
6 TO 24	± .03	±
ABOVE 24	± .06	±
ANGULAR DIMENSION ±		

FINISH

Sierra
MENLO PARK, CALIFORNIA 94025

CODE IDENT. NO. 54778

SCHEMATIC, A5A PWB FILTER-GAIN

ASSY. OR ITEM	QTY. MUST	SEE SHEET	SHEET	DNS
		NEXT ASSY.	MODEL NO.	
APPLICATION				

DATE	SIZE	DRAWING NO.	REV.
12/15/80	D	D03401700	G1
BY			
CHECKED			
APPR			
SCALE NONE	STOCK AS	SHEET 2 OF 3	

D03401700 G1

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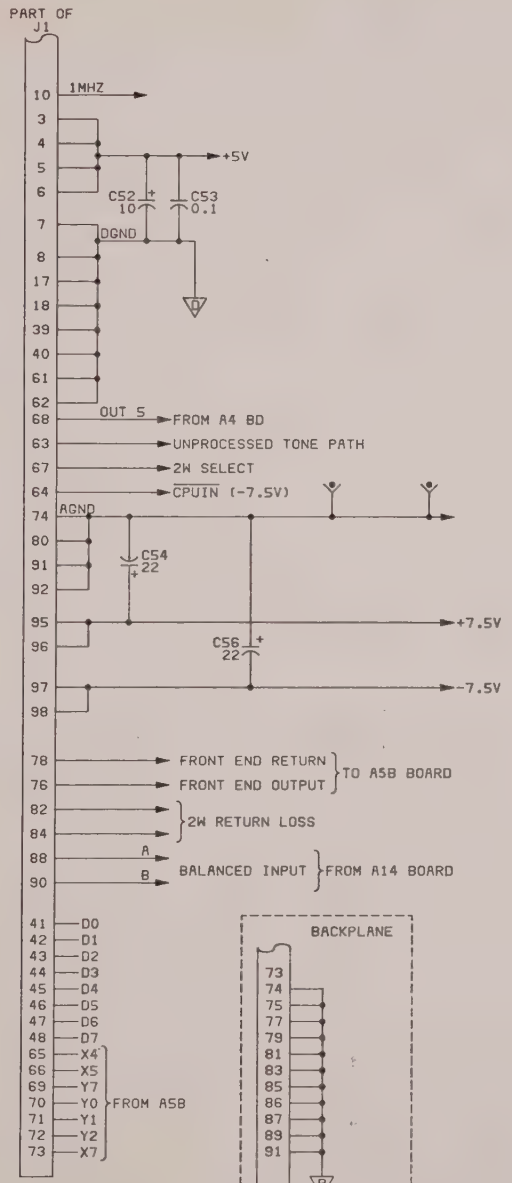
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



IC POWER PIN-OUT

REF DESIG	IC TYPE	+5	DGND	+7.5	AGND	-7.5	+F	-F	F GND
U6,U8,U9,U10	TL084CN			4		11			
U1,U2,U4	LF353						8	4	
U7,U12,U13	HI-5043	12		11	13	14			
U3	HI-5043						11,12	14	13
U11	4013			14		7			
U15	DAC0830		10	20	3				

COMPONENTS DESIGNATION

FIRST USED	LAST USED	NOT USED
C1	C77	-
T1	T3	-
L1	L5	-
U1	U16	-
K1	K2	-
Q1	Q4	-
CR1	CR25	-
R1	R88	R15,R84,R85

4. ALL RESISTANCE VALUES ARE IN OHMS.
3. ALL RESISTORS ARE 1/8W, ±1%.
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
1. ALL DIODES ARE IN4148.

NOTES - UNLESS OTHERWISE SPECIFIED:

QTY.	QTY.	QTY.	ITEM NO.	PART OR IDENTIFYING NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
				LIST OF MATERIAL OR PARTS LIST			

ALL THREADS UNIFIED SERIES, EXTERNAL THREADS TO BE CLASS 2A, INTERNAL THREADS TO BE CLASS 2B AFTER FINISH, UNLESS OTHERWISE SPECIFIED

FINISH FOR MACHINED SURFACES UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DWG.

DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

TOLERANCE UNLESS SPECIFIED

BASIC	TWO PLACE	THREE PLACE
UP TO 6	± .02	±
6 TO 24	± .03	±
ABOVE 24	± .06	±

ANGULAR DIMENSION ±

FINISH

Sierra
A DIVISION OF LEAR SIEGLER INC.
MENLO PARK, CALIFORNIA 94025

CODE IDENT NO 54778

SCHEMATIC, A5A PWB FILTER-GAIN

ASSY. OR ITEM	QTY NEXT	SEE SHEET ONE
APPLICATION	NEXT ASSY.	MODEL NO

DATE
BY D. A. JENSEN
CHECKED
APPR

SIZE D | DRAWING NO. D03401700 | REV G1

SCALE NONE | STOCK AS | SHEET 3 OF 3

DWG. D03401700

BITECH L55039 DP-3 C3/AN4

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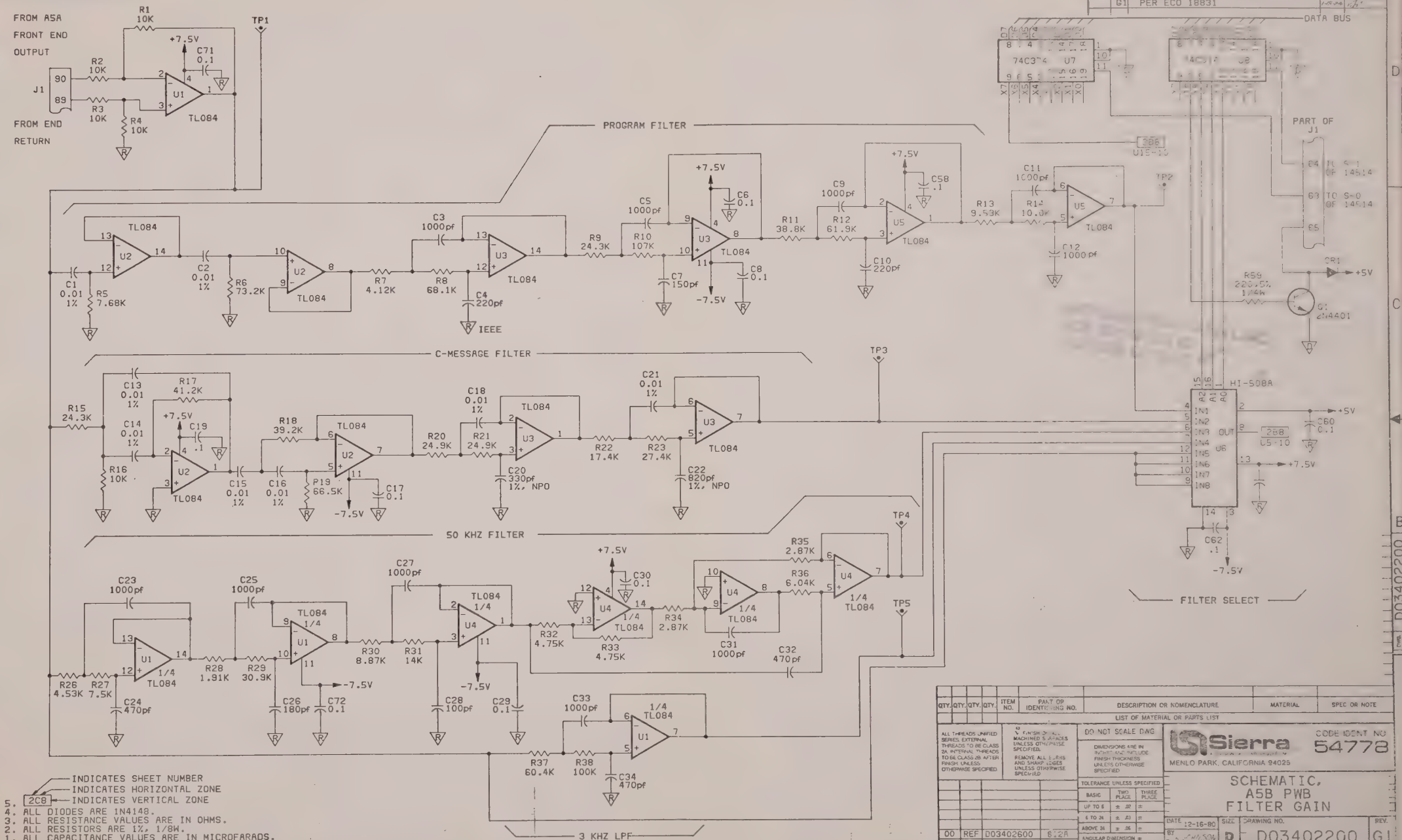
REVISIONS			
ZONE	LTR	DESCRIPTION	DATE
	G1	PER ECO 18831	



INDICATES SHEET NUMBER
INDICATES HORIZONTAL ZONE
2C8 INDICATES VERTICAL ZONE

5. 2C8
4. ALL DIODES ARE IN4148.
3. ALL RESISTANCE VALUES ARE IN OHMS.
2. ALL RESISTORS ARE 1%, 1/8W.
1. ALL CAPACITANCE VALUES ARE IN MICROFARADS.

NOTES: UNLESS OTHERWISE SPECIFIED:

QTY.	QTY.	QTY.	ITEM NO.	PART OR IDENTIFYING NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE

LIST OF MATERIAL OR PARTS LIST

ALL THREADS UNIFIED SERIES, EXTERNAL THREADS TO BE CLASS 2A, INTERNAL THREADS TO BE CLASS 2B AFTER FINISH UNLESS OTHERWISE SPECIFIED

FINISH ON ALL MACHINED SURFACES UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DWG

DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

TOLERANCE UNLESS SPECIFIED		
BASIC	TWO PLACE	THREE PLACE
UP TO 6	± .02	±
6 TO 24	± .01	±
ABOVE 24	± .06	±
ANGULAR DIMENSION	±	

FINISH:

DO	REF	D03402600	8128
ASSY. OR ITEM	QTY. NEXT	NEXT ASSY.	MODEL NO

APPLICATION

Sierra
MENLO PARK, CALIFORNIA 94025
CODE IDENT NO 54778

SCHEMATIC, A5B PWB FILTER GAIN

DATE	SIZE	DRAWING NO.	REV.
12-16-80	D	D03402200	G1

BY
CHECKED
SCALE NONE
SHEET 1 OF 3

D03402200

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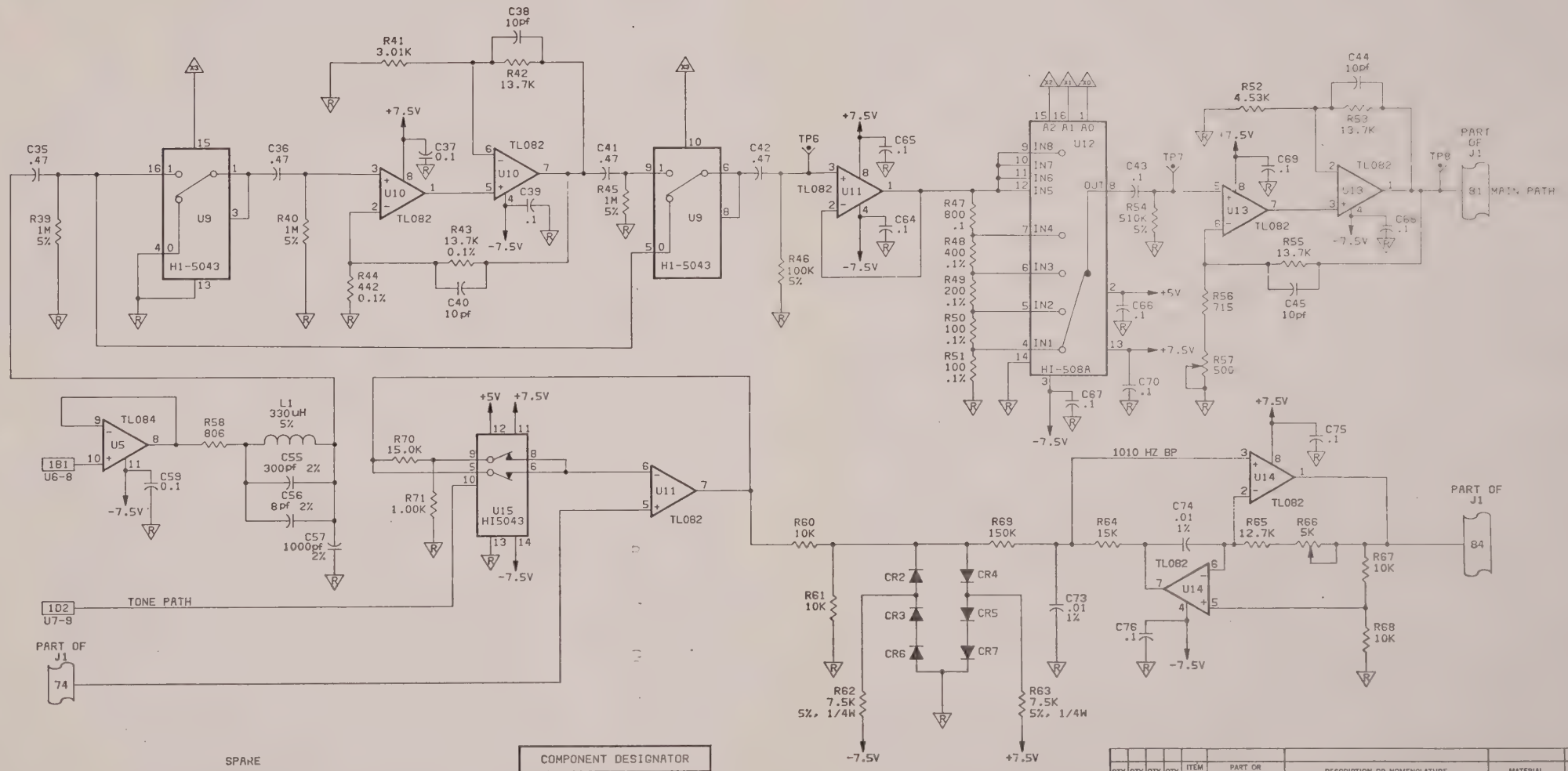
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



COMPONENT DESIGNATOR		
FIRST USED	LAST USED	NOT USED
U1	U15	
Q1	Q1	
CR1	CR7	
L1	L1	
R1	R71	R24, R25
C1	C76	C52

QTY.	QTY.	QTY.	ITEM NO.	PART OR IDENTIFYING NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
					LIST OF MATERIAL OR PARTS LIST		

ALL THREADS UNIFIED SERIES. EXTERNAL THREADS TO BE CLASS 3A, INTERNAL THREADS TO BE CLASS 2B, AFTER FINISH, UNLESS OTHERWISE SPECIFIED.

FINISH ALL MACHINED SURFACES UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED.

DO NOT SCALE DWG. DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

TOLERANCE UNLESS SPECIFIED			
BASIC	TWO PLACE	THREE PLACE	
UP TO 6	± .02	±	
6 TO 24	± .03	±	
ABOVE 24	± .06	±	
ANGULAR DIMENSION ±			
FINISH:			

ASSY. OR ITEM	QTY. NEXT	NEXT ASSY.	MODEL NO.
00	REF	D03402600	812A
APPLICATION			

Sierra — MENLO PARK, CALIFORNIA 94025 — CODE IDENT NO 54778

SCHEMATIC, A5B PWB FILTER GAIN

DATE	SIZE	DRAWING NO.	REV.
12-16-80	D	D03402200	G1
BY			
CHECKED			
APPR	SCALE NONE	STOCK AS ——	SHEET 2 OF 3

DWG. NO. D03402200

DITEDS 150941 REV 12JAN84

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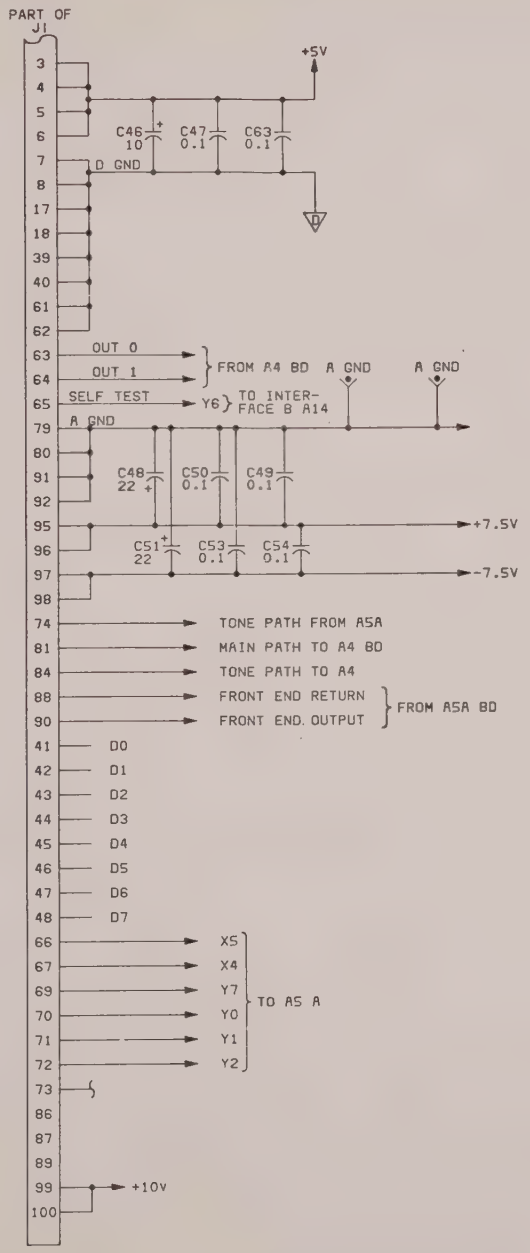
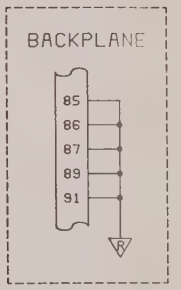
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHT 1		





IC TYPE	DESIGNATOR	+5V	D GND	+7.5V	A GND	-7.5V
TL082CN	U10,U13,U11,U14			8		4
TL084CN	U1,U2,U3,U4,U5			4		11
HI-5043	U9,U15	12		11	13	14
HI-508A	U6,U12			13	14	3
MM74C374	U7,U8	20	10			

QTY	QTY	QTY	QTY	ITEM NO	PART OR IDENTIFYING NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
						LIST OF MATERIAL OR PARTS LIST		

ALL THREADS UNIFIED SERIES EXTERNAL THREADS TO BE CLASS 2A, INTERNAL THREADS TO BE CLASS 2B AFTER FINISH UNLESS OTHERWISE SPECIFIED

FINISH ON ALL MACHINED SURFACES UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DWG.

DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

TOLERANCE UNLESS SPECIFIED		
BASIC	TWO PLACE	THREE PLACE
UP TO 6	± .02	±
6 TO 24	± .03	±
ABOVE 24	± .06	±
ANGULAR DIMENSION ±		

FINISH: ——

Sierra, A DIVISION OF LEAR SIEGLER INC.
MENLO PARK CALIFORNIA 94025

CODE IDENT. NO. 54778

SCHEMATIC, A5B PWB FILTER GAIN

ASSY. OR ITEM	QTY. NEXT	NEXT ASSY.	MODEL NO
00	REF	D03402600	9129
APPLICATION			

DATE	SIZE	DRAWING NO.	REV.
12-16-83	D	D03402200	G1
BY L. HANSON			
CHECKED			
APPR	SCALE NONE	STOCK AS ——	SHEET 3 OF 3

D03402200

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REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	H1	PER ECO 18831	1-8-84	

6. ALL .1 CAPACITORS ARE MINI - CERAMICS.
5. U10 PROGRAMMED EPROM S18120006.
4. ALL RESISTANCE VALUES ARE IN OHMS.
3. ALL RESISTORS ARE 1/8W, ±1%.
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
1. ALL DIODES ARE IN4148.
NOTES - UNLESS OTHERWISE SPECIFIED:

COMPONENTS DESIGNATION		
FIRST USED	LAST USED	NOT USED
C1	C36	C1
CR1	CR5	
Q1	Q5	
R1	R45	
T1	T2	
U1	U33	U2

ATTENUATOR & OUTPUT DRIVER

QTY	QTY	QTY	QTY	ITEM NO	PART OR IDENTIFYING NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
						LIST OF MATERIAL OR PARTS LIST		

ALL THREADS UNIFIED SERIES EXTERNAL THREADS TO BE CLASS 2A, INTERNAL THREADS TO BE CLASS 2B AFTER FINISH UNLESS OTHERWISE SPECIFIED

FINISH ON ALL MACHINED SURFACES UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DWG.

DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

TOLERANCE UNLESS SPECIFIED	BASIC	TWO PLACE	THREE PLACE
UP TO 6		± .02	±
6 TO 24		± .03	±
ABOVE 24		± .06	±
ANGULAR DIMENSION		±	

FINISH:

Sierra
A DIVISION OF LEAR SIEGLER INC.
MENLO PARK, CALIFORNIA 94025

CODE IDENT. NO 54778

SCHEMATIC DIAGRAM, TRANSMITTER- A8 PWB

ASSY. OR ITEM	CTY. NEXT	NEXT ASSY	MODEL NO
00	REF	C03396500	F 78
		APPLICATION	

DATE	SIZE	DRAWING NO.	REV.
8/24/79	D	D03367500	H1
BY			
CHECKED			
APPR	SCALE NONE	STOCK AS	SHEET 1 OF 3

D03367500

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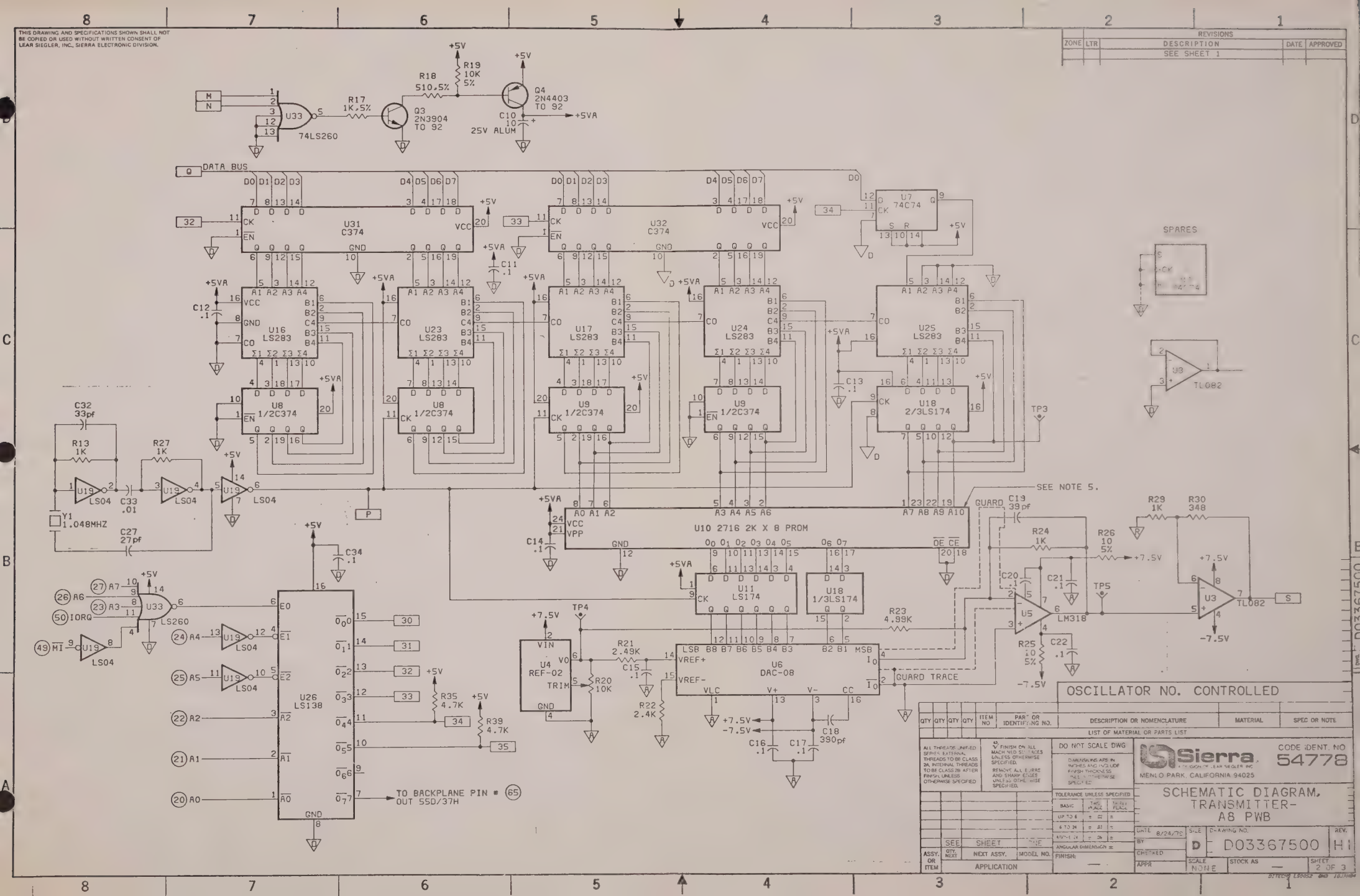
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



QTY	QTY	QTY	QTY	ITEM NO	PART OR IDENTIFYING NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
						LIST OF MATERIAL OR PARTS LIST		

ALL THREADS UNIFIED SERIES EXTERNAL THREADS TO BE CLASS 2A, INTERNAL THREADS TO BE CLASS 2B AFTER FINISH, UNLESS OTHERWISE SPECIFIED

√ FINISH ON ALL MACHINED SURFACES UNLESS OTHERWISE SPECIFIED. REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED.

DO NOT SCALE DWG.

DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

Sierra
A DIVISION OF LEAR SIEGLER INC.
MENLO PARK, CALIFORNIA 94025

CODE IDENT. NO 54778

TOLERANCE UNLESS SPECIFIED	TWO PLACE	THREE PLACE
BASIC	± .01	±
UP TO 6	± .01	±
6 TO 24	± .01	±
OVER 24	± .06	±

ANGULAR DIMENSION ±

FINISH —

SCHEMATIC DIAGRAM, TRANSMITTER- A8 PWB

ASSY. OR ITEM	QTY. NEXT	NEXT ASSY.	MODEL NO.
APPLICATION			

SEE SHEET NONE

DATE	SIZE	DRAWING NO.	REV.
8/24/78	D	D03367500	H1
BY			
CHECKED			
APPR			
SCALE NONE	STOCK AS —	SHEET 2 OF 3	

D03367500 H1

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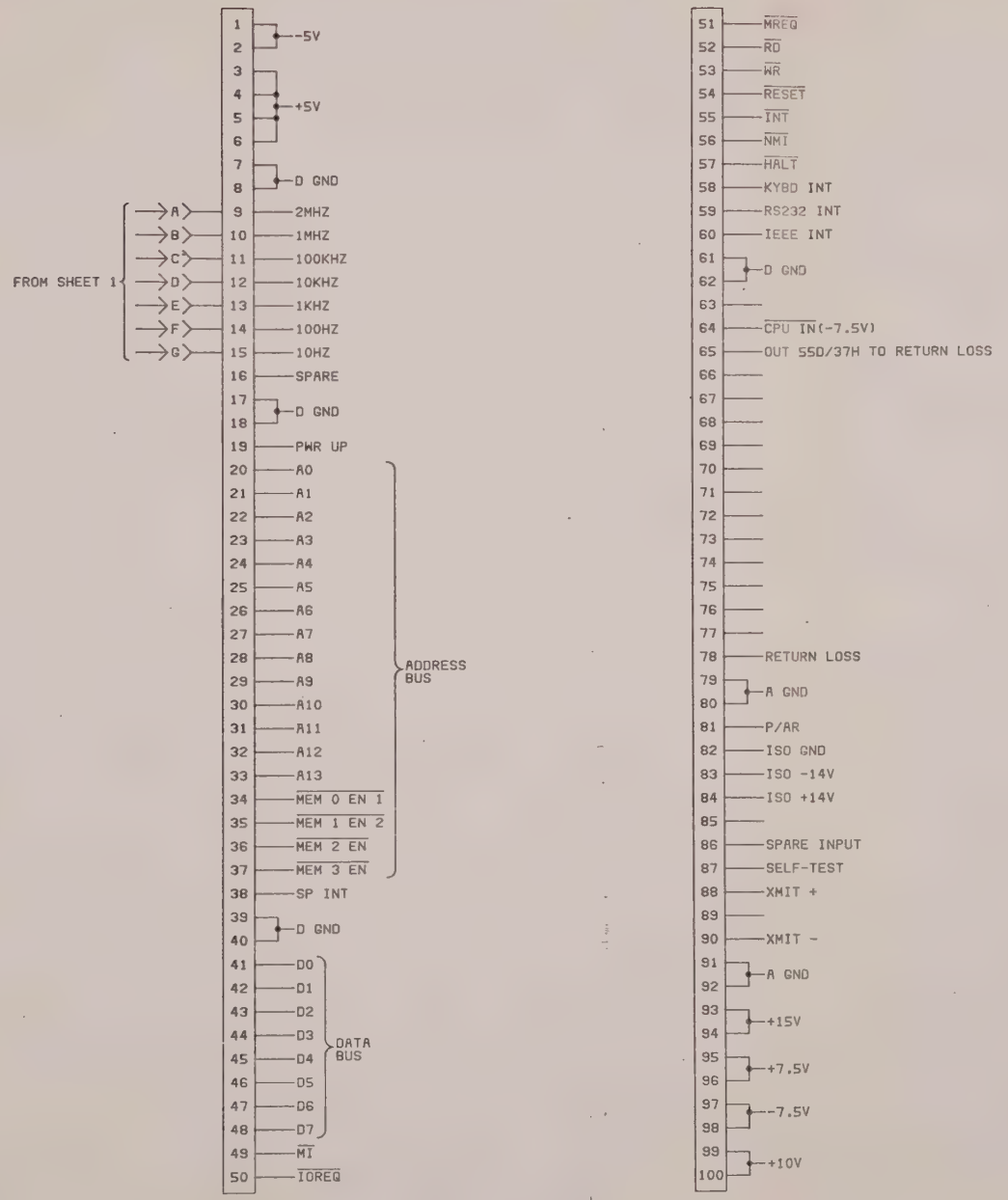
BACKPLANE BUS DESIGNATIONS

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1		



IC POWER PIN-OUT

REF DESIG	IC TYPE	+5V	+5VA	D	+7.5V	-7.5V	A-R	+ISO	-ISO	GND
U1	4027				16					
U3	TL082				8	4				
U4	REF-02				2		4			
U5	LM318				7*	4*				
U6	DAC 08				13	3	1			
U7	74C74	14		7						
U8	74C374		20	10						
U9	74C374		20	10						
U10	2716		24	12						
U11	74LS174		16	8						
U12	TL082				8	4				
U13	TL082				8	4				
U14	TL082				8	4				
U15	4053				16**	7	8			
U16	74LS283		16	8						
U17	74LS283		16	8						
U18	74LS174		16	8						
U19	74LS04	14		7						
U20	4051				16**	7	8			
U21	AD7531K				16		3			
U22	4051				16**	7	8			
U23	74LS283		16	8						
U24	74LS283		16	8						
U25	74LS283		16	8						
U26	74LS138	16		8						
U27	TL082							8	4	
U28	74C74	14		7						
U29	74C374	20		10						
U30	74C374	20		10						
U31	74C374		20	10						
U32	74C374		20	10						
U33	74LS260	14		7						

* SUPPLIED THROUGH A RESISTOR
** SUPPLIED THROUGH TWO DIODES

BACKPLANE DESIGNATIONS

QTY.	QTY.	QTY.	QTY.	ITEM NO.	PART OR IDENTIFYING NO.	DESCRIPTION OR NOMENCLATURE	MATERIAL	SPEC OR NOTE
						LIST OF MATERIAL OR PARTS LIST		

ALL THREADS UNIFIED SERIES EXTERNAL THREADS TO BE CLASS 2A, INTERNAL THREADS TO BE CLASS 2B AFTER FINISH, UNLESS OTHERWISE SPECIFIED

63 FINISH ALL MACHINED SURFACES UNLESS OTHERWISE SPECIFIED.

REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE SPECIFIED.

DO NOT SCALE DWG.

DIMENSIONS ARE IN INCHES AND INCLUDE FINISH THICKNESS UNLESS OTHERWISE SPECIFIED

TOLERANCE UNLESS SPECIFIED		
BASIC	TWO PLACE	THREE PLACE
UP TO 6	± .02	±
6 TO 24	± .03	±
ABOVE 24	± .06	±
ANGULAR DIMENSION ±		

FINISH —

Sierra
MENLO PARK, CALIFORNIA 94025

CODE IDENT. NO. 54778

SCHEMATIC DIAGRAM, TRANSMITTER-A8 PWB

DATE	SIZE	DRAWING NO.	REV.
8/24/79	D	D03367500	H1

BY —
CHECKED
APPR
SCALE NONE
STOCK AS —
SHEET 3 OF 3

SEE SHEET 1

ASSY. OR ITEM | QTY NEXT | NEXT ASSY. | MODEL NO.
APPLICATION

DIMENSIONS ARE IN INCHES AND TOLERANCES ARE AS FOLLOWS

D03367500 H1

Schematic for A11 Board

There have been changes to the A11 Board per page 2 of Engineering Change Order # 19384. C17 has been removed and TS1 has been added. Following this page is a section of the schematic showing the changes.

WARRANTY

SIERRA ELECTRONIC DIVISION, LEAR SIEGLER, INC. warrants products manufactured by it to be free from defects in material and workmanship and to meet the applicable specifications under normal use and service for a period of 12 months from the date of original shipment by us. Our obligation under this warranty is limited to the repair or replacement of such products which, after having been returned to the factory or a point designated by us, shall be examined and in our sole opinion, found defective and that such defect was not induced by causes external to the product. Alternately, SIERRA may elect to issue credit for any such defective product. All products to be repaired or replaced shall be returned prepaid to the designated place of repair in accordance with authorization and packing and shipping instructions issued by SIERRA. Return shall not be made until such authorization and instructions are issued. Each returned product shall be accompanied by a statement or report fully stating the claimed defects and any other pertinent information concerning the failure.

SIERRA's responsibility under this warranty does not apply to any products which have been repaired, worked upon or altered by persons not authorized by us so as to in our sole judgement, injure the stability or reliability of such product, or which have been subject to misuse, negligence or accident, or where applicable, the serial number has been altered, effaced or removed. SIERRA shall not be liable for damages resulting from the use of the purchased product, nor shall SIERRA be responsible for any failure in the performance of other items to which the purchased product is connected or the functioning of an entire system or parts of any system of which the purchased product may be a part.

SIERRA reserves the right to make changes in the design or construction of any of its products at any time without incurring any obligation to make changes whatever on units previously purchased. Accessories, including but not limited to all vacuum tubes, fuses, pilot lamps and batteries used with our products are not covered by this warranty. A test setup charge of $100.00 will apply to any returned instrument or microwave component which, after test, is found to meet the applicable specifications.

This warranty is in lieu of all other warranties, expressed, implied or statutory. No representative or person is authorized to represent nor assume for SIERRA any liability in connection with the sale of products other than set forth herein. IN NO EVENT SHALL SIERRA BE LIABLE FOR SPECIAL INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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